Mineral Resources Branch

Summary of Operations

1980

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources

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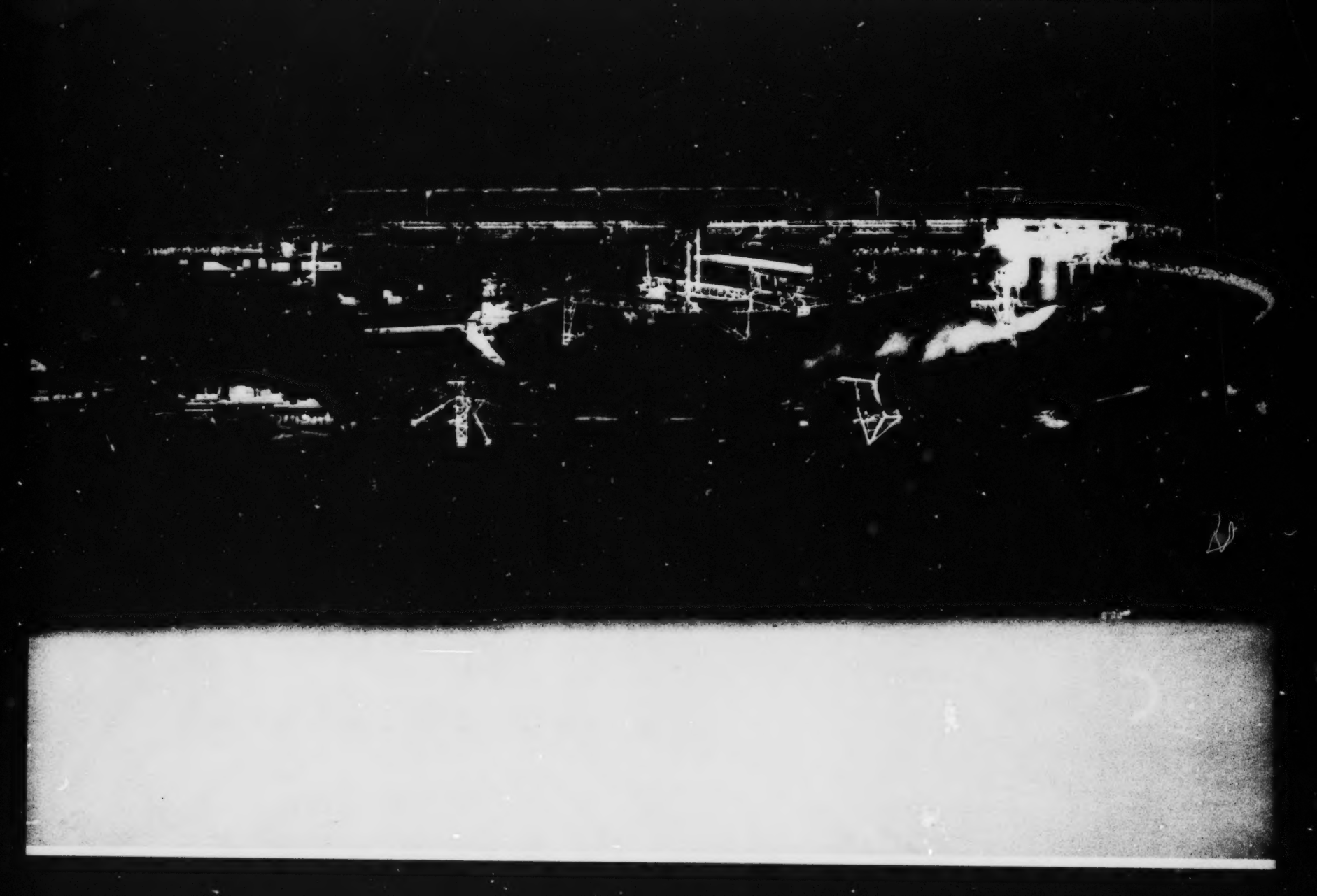

FOREWORD

The *Summary of Operations, 1980, Mineral Resources Division* provides a review of the mineral industry, detailed statistics of its performance and a summary of the activities of the Mineral Resources Division in 1980. These three elements, review, statistics and operations of the Division, form three chapters that follow the format of equivalent chapters in the Annual Report of the Minister in 1979. The creation of a volume, Summary of Operations, parallels the practice in the Petroleum Division and it is intended to eventually get the data of the industry to the interested public in a more timely manner while leaving the Annual Report of the Minister free of details and statistics.

The evolution of yearly reports continues as the growth and diversification of industry related to mineral and fuel resources diversifies and as the Ministry reacts. Annual Reports of the Minister of Mines have been published from 1874. Changes in name of the Ministry occurred in 1959 to Mines and Petroleum Resources and in 1978 to Energy, Mines and Petroleum Resources. In addition in 1969 geological and technical reports previously published as part of the Annual Report were published separately as *Geology, Exploration and Mining in British Columbia*. Starting in 1975, this technical volume has been divided into separate reports that are issued as they are prepared. Detailed information on mine safety, fatal accidents, dangerous occurrences, etc., was included in the Annual Report until 1973, for 1974 was issued separately, and subsequently forms part of the separate volume *Mining in British Columbia*.

The Mineral Industry in 1980

CHAPTER 1

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INTRODUCTION

The mineral industry in its broadest context includes all primary industry based on geological or subsurface resources. This introduction reviews this broad aspect to relate the metallic, non-metallic, coal, and petroleum based industries before being concerned only with the solid minerals that are mined.

The value of mineral production in British Columbia in 1980 reached another new record of over $3 billion, surpassing the previous record of 1979 by $61.7 million or 2 per cent. The top 10 commodities in 1980 in order of value were copper, natural gas, coal, molybdenum, crude oil, lode gold, silver, sand and gravel, cement, and asbestos. Copper thus recovered the leading position it has occupied for most of the last decade. The only other changes are that lead disappeared from the list with a production value of $66 million and sand and gravel moved up to eighth position. For the first time three non-metallic or non-fuel commodities appeared in the top 10 list. This is an indication that the mineral industry is maturing and related industrial complexes are expanding.

British Columbia is Canada's leading producer of molybdenum, copper, and coal. It is also a major contributor to Canada's production of lead, silver, zinc, gold, asbestos, and natural gas.

The 1980 mineral production is shown in detail in Table 1-1 where it is compared to that of 1979. The relative values of commodities produced in 1980 are diagrammed on Fig. 1-1.

In 1980 all sectors of the industry except petroleum and natural gas increased in production value. However, quantities of most commodities produced were down and increased prices were generally responsible for the rise in value. The non-metallic sector, industrial minerals and structural materials, showed the best performance. Production quantities were up for many commodities, particularly asbestos, jade, crushed rock, lime and limestone, and cement. This is reflected in a major increase in production value. In metals, only the quantity of placer gold and molybdenum produced increased, coal production was up slightly, and all commodities in the petroleum and natural gas sector were down.

The total value and percentage change for the various sectors were as follows:

	1980 Value $	Change *Per cent*
Metals	1 429 002 180	+5.8
Petroleum and natural gas	761 063 374	-15.1
Coal	461 492 857	+5.1
Structural Materials	242 325 657	+35.7
Industrial Minerals	115 926 007	+39.5

The changing proportions contributed by the various sectors are illustrated by two diagrams. Fig. 1-2 shows the growth in total value in actual and deflated dollars. Fig. 1-3 shows the relative proportions contributed by the various sectors. In both diagrams the trends are shown in five-year increments except for the last decade.

The long-term trends shown by the figures are as follows:

- Dominance of metals throughout the whole period, but a fairly constant decrease of importance since 1935. Minor reversals of this trend as a result of the surge in production of metals related to coming on stream of the major porphyry copper and molybdenum open-pit mines in 1972 and 1973.
- The collapse of the steam coal industry between 1945 and 1970, related significantly to conversion of railways to oil.
- Regeneration of coal production related to growth of export markets for metallurgical coals in the early 1970's.

- Rapid growth of the petroleum and natural gas production between 1955 and 1965.
- Major increase in production value of natural gas in 1975 and 1976.
- Steady growth of industrial minerals and structural materials.

The short-term trends indicated are:

- The major drop in natural gas production.
- Significant increase in importance of industrial minerals and structural materials.
- Steady state in coal.
- Slight increase in metals.

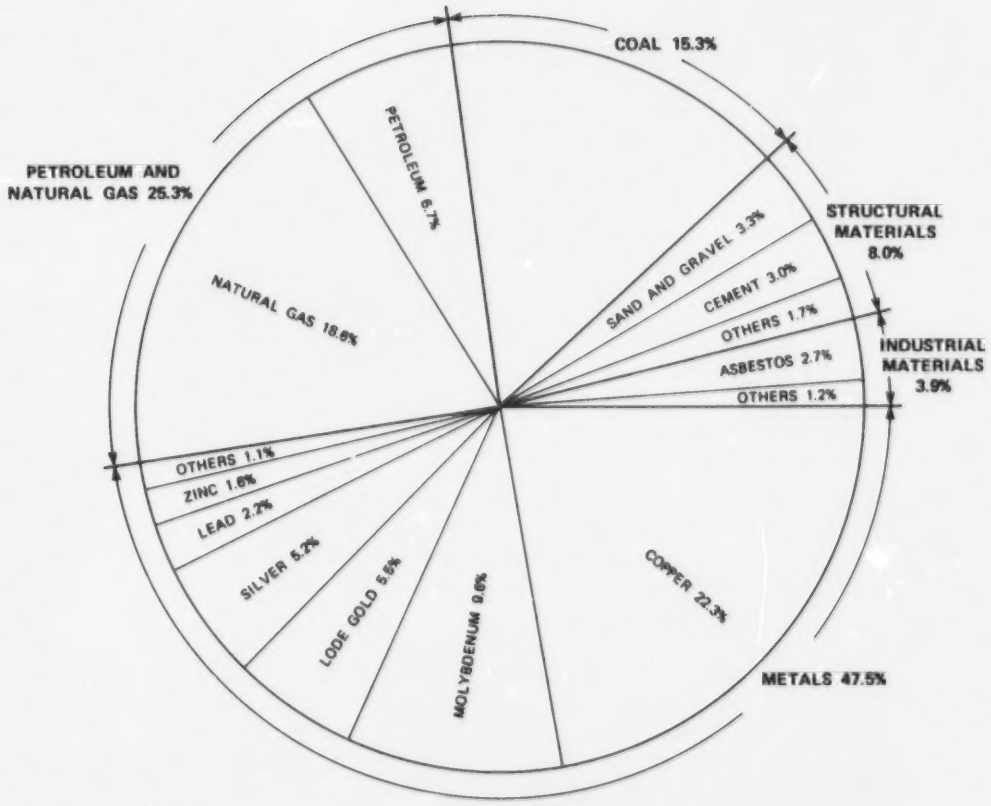


Figure 1-1 — Major mineral commodities produced in 1980 by value.

Table 1-1 — Mineral Production of British Columbia, 1979 and 1980

		1979		1980	
	Units	Quantity	Value	Quantity	Value
			$		$
Metals					
Antimony	kg	177 046	916 081	78 654	416 080
Bismuth	kg	33 809	173 667	23 501	136 306
Cadmium	kg	239 096	1 417 506	92 360	560 679
Copper	kg	272 163 001	656 359 923	264 674 830	670 623 616
Gold—placer	g	214 106	2 649 918	280 104	6 213 376
Gold—lode, fine	g	8 062 810	101 481 156	7 197 312	163 930 073
Iron concentrates	t	668 026	13 008 475	653 324	13 670 233
Lead	kg	84 451 905	88 100 363	76 709 447	66 096 223
Molybdenum	kg	10 766 497	321 228 104	11 209 501	288 934 398
Platinum	g	280	3 793		
Silver	g	214 117 518	94 700 656	203 801 811	156 548 306
Tin	kg	240 984	3 818 948	139 517	2 438 881
Zinc	kg	88 418 642	61 890 891	67 481 328	49 363 417
Others			5 027 280		10 070 592
Subtotals			1 350 776 761		1 429 002 180
Industrial Minerals					
Asbestos	t	94 286	65 520 069	100 089	81 688 936
Diatomite	t	1 452	33 025	3 615	138 273
Fluxes	t	27 741	129 035	43 986	93 135
Granules	t	30 074	1 458 987	31 393	1 694 947
Gypsum and gypsite	t	718 557	3 782 628	751 067	5 387 949
Jade	kg	258 505	1 325 777	449 156	1 580 241
Sulphur	t	383 724	9 616 390	359 413	21 712 359
Others			1 235 073		3 630 167
Subtotals			83 100 984		115 926 007
Structural Materials					
Cement	t	1 336 080	80 052 461	1 351 320	90 881 086
Clay products			11 744 194		10 387 121
Lime and limestone	t	2 880 138	8 037 476	3 129 762	9 945 044
Rubble, riprap and crushed rock	t	2 488 389	6 766 665	7 019 167	32 436 456
Sand and gravel	t	46 241 983	71 918 633	45 278 202	98 666 100
Building stone	t	2 194	19 700	91	9 850
Subtotals			178 539 129		242 325 657
Coal					
Coal—sold and used	t	10 570 370	439 280 152	10 823 530	461 492 857
Total solid minerals			2 051 697 026		2 248 746 701
Petroleum and Natural Gas					
Crude oil	m^3	2 139 963	168 928 671	2 002 128	184 347 641
Field condensate	m^3	32 549	2 569 418	36 855	3 605 414
Plant condensate	m^3	184 398	13 396 500	133 601	13 657 452
Subtotals			184 894 589		201 610 507
Natural gas to pipeline	10^3m^3	11 392 641	699 508 127	8 931 833	546 911 784
Butane	m^3	112 683	7 122 711	89 556	7 350 486
Propane	m^3	84 864	4 851 698	75 507	5 190 597
Subtotals			711 482 536		599 452 867
Total petroleum and natural gas			896 377 125		761 063 374
Grand totals			2 948 074 151		3 009 810 075

CONVERSION TABLE

Metric	Symbol
Tonnes	t ÷ .90718=short tons.
Kilograms	kg ÷ .45359=pounds.
Grams	g ÷ 31.103=troy ounces.
Cubic metres	m^3 × 6.29=barrels.
Thousand cubic metres	10^3m^3 × 35.49373=thousand standard cubic feet.

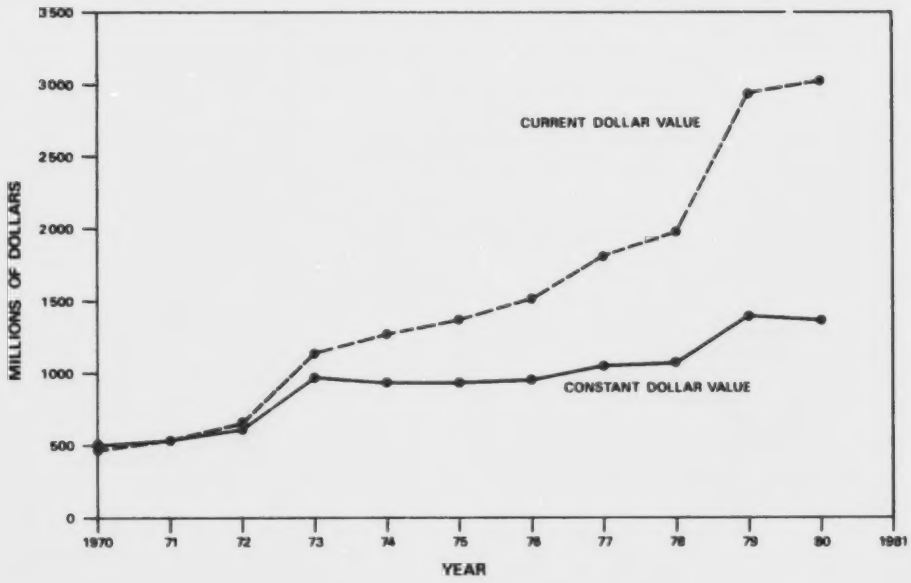


Figure 1-2 — Growth of the mineral industry in total value in actual dollars and deflated dollars.

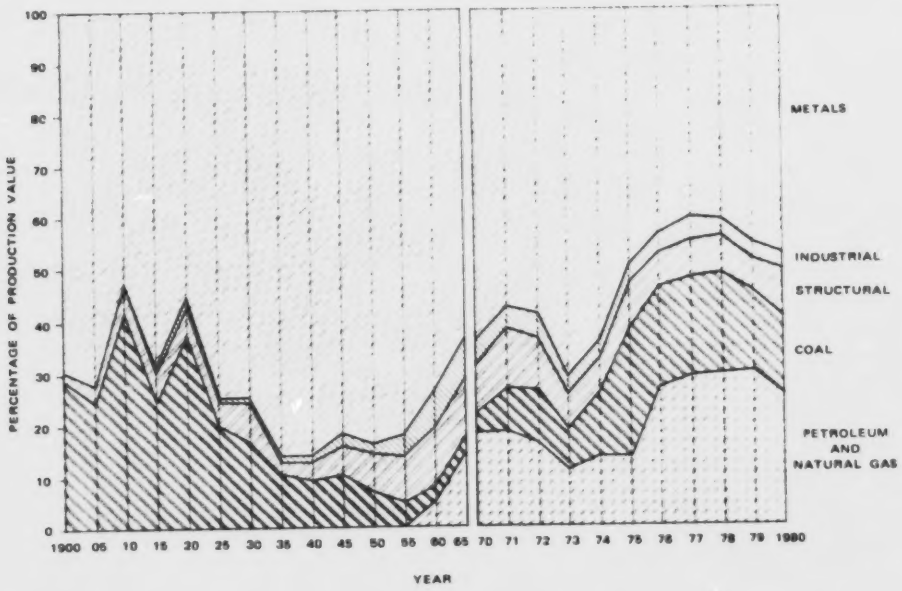


Figure 1-3 — Percentage value of mineral industry sectors.

REVENUE TO THE CROWN

Direct revenue to the provincial government in 1980 from the mining and petroleum industries is shown on Figure 1-4.

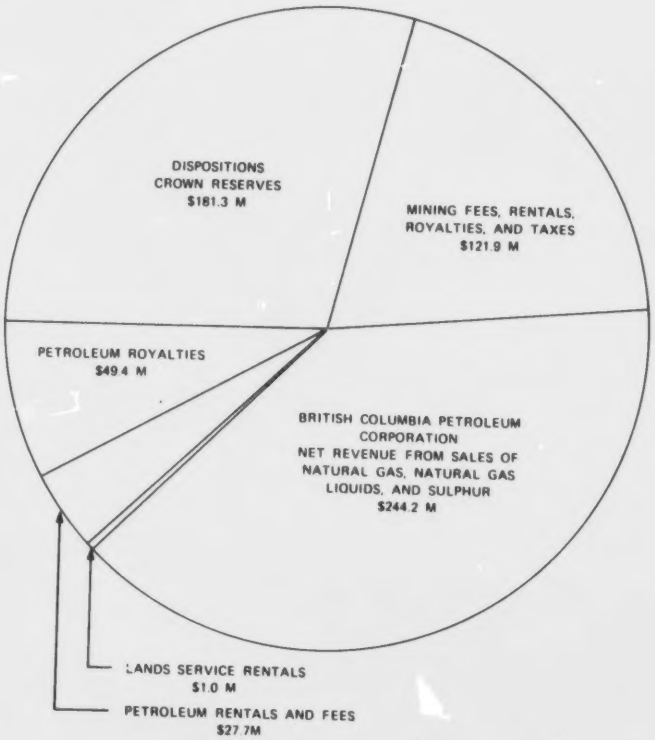


Figure 1-4 — Direct revenue to the provincial government from the mineral and petroleum industries, 1980.

Table 1-2 — Direct Revenue to the Provincial Government from the Petroleum and Mineral Industries, 1980

	$
Petroleum Industry—	
Crown reserves — disposition	181 266 804
Rental and fees	27 714 498
Crown royalties	49 369 549
British Columbia Petroleum Corporation—	
Net revenue from sales	244 168 144
Mining Industry—	
Claims, fees, and rentals	7 971 635
Royalties	5 377 073
Mineral taxes	108 546 437
Lands Service—	
Rentals and royalties on structural materials	997 212
Total	625 411 352

THE MINING INDUSTRY IN 1980

By A. Sutherland Brown, J. Clancy, and W. Wilson

The total value of solid minerals set another record, $2.249 billion, up 9.6 per cent over 1979. This was achieved in the face of slight declines in the production quantities of many of the major metals, a minor increase in coal, and variable but fairly common increases in non-metallic commodities.

Table 1-1 and Figure 1-1 show the quantity and value of solid minerals produced in 1980 and the table compares production with that of 1979. The ratios of the various sectors of the mining industry are as follows: Metals, 63.6 per cent; coal, 20.5 per cent; structural materials, 10.8 per cent; and industrial minerals, 5.1 per cent.

Metals

Graphs of the quantity of yearly production for the major base metals of the province are shown on Fig. 1-5. These plus gold and silver are shown on a log graph on Figure 3-2.

The graphs show that lead and zinc production advanced sharply in the period 1920 to 1943, thereafter starting a slow decline, a feature dependent principally on the production history of the Sullivan mine. In contrast, copper production remained at a modest level until the onset of major porphyry copper production in the late sixties. Molybdenum production also started its growth in this period, related principally to mining of porphyry deposits. Precious metals are not shown on Figure 1-5 but are on Figure 3-2. Their history since the decline in the forties increasingly has been related to by-product origin related to production of base metals at massive sulphide and porphyry deposits. However, the sharp rise in precious metals is greatly stimulating exploration for gold and silver deposits. Lead times to production in small vein deposits are relatively short so production will increase sharply.

In 1980 copper regained its premier position from natural gas although production quantity at 264 675 tonnes was down slightly but the net price was up marginally to compensate. In contrast natural gas sales were down substantially. The value of copper production in 1980 at $670.6 million contributed 46.9 per cent to the value of metal production and 29.8 per cent to solid minerals. The small fall in production resulted from minor decreases at most mines.

For molybdenum, the second metal, markets continued to be strong through 1980; however the value of production in 1980 dropped to $288.9 after the unusually high price in 1979. The quantity was up fractionally at 11.2 million kilograms compared to 10.8 million kilograms in 1979.

Lode gold, the third metal for the second year, had a sizeable drop in production quantity, to 7.197 million grams from 8.062 million grams in 1979. However, the average price for gold rose from $12.58 per gram to $22.79 per gram in 1980.

Silver had a similar pattern. Production was down 4.8 per cent but the average price received was 77 cents per gram, up from 44 cents per gram in 1979, so that the gross value of production was up 65.3 per cent to $156.5 million.

Lead rose to fifth position among the metals but no longer was among the top 10 mineral commodities in the province. The value of lead production at $66.1 million was well ahead of zinc.

Zinc production was down substantially in quantity and value and has not been among the top 10 commodities for two years. Production was down 23.7 per cent while value was down 20.2 per cent.

Iron concentrate production was down slightly from 1979 in quantity but up slightly in value to $13.7 million. All production came from Tasu except for a small amount for heavy media for coal mines that came from Craigmont.

Of the minor metals, tin production fell 42 per cent to 139 517 kilograms with a decreased value of $2.4 million while quantities and values were down for antimony, bismuth, and cadmium, as these are by-products of lead and zinc.

Coal

Coal continued in third place in relationship to all commodities and second in relationship to solid minerals. Production was up 2.4 per cent to 10.8 million tonnes and value was up 5.1 per cent to $461.5 million.

Industrial Minerals

Production value increased by 39.5 per cent to $115.9 million. Asbestos production was 100 089 tonnes compared to 94 286 tonnes in 1979. Sulphur products were down but the value rose sharply to $21.7 million. Gypsum production was up substantially to a value of $5.39 million.

Structural Materials

The value of production was up for the twelfth year in a row with a total of $242.3 million, a 35.7 per cent increase over 1979. Sand and gravel at $98.7 million and cement at $90.9 million, the two most valuable structural materials, were both up significantly. They advanced to become eighth and ninth most valuable mineral commodities following silver and ahead of asbestos, lead, and zinc.

PROVINCIAL REVENUE FROM MINING COMPANIES

Direct revenue to the provincial government in 1980, derived from the mining sector of the mineral industry, is shown in Table 1-3. The amount for mineral royalties shown is the amount collected after adjustment for 1979. For coal licences and rentals, the amount shown includes cash paid in lieu of work, some of which may be refundable. Rentals and royalties on industrial minerals and structural materials were collected by the Land Service of the Ministry of Environment. The total revenue is about $122.9 million compared to $62.6 million in 1979.

Table 1-3—Revenue from Mineral Resources, 1980

	$
Claims	3 492 635
Coal Licence fees and rentals collected	4 479 000
Coal royalties	5 228 891
Iron ore royalties	148 182
Mineral taxes	10 403 808
Mineral resource taxes	79 681 651
Mining taxes	18 460 978
Rental and royalties on industrial minerals and structural materials (Lands Service)	997 212
Total	122 892 357

EXPENDITURES BY MINING COMPANIES

Major expenditures in 1980 by companies involved in exploration, development, and mining of metals, minerals, and coal are shown in Table 1-4.

Table 1-4—Expenditures (Mining Companies), 1980

	$	$
Capital expenditures	395 817 815	
Exploration and development	346 290 323	742 108 138
Mining operations (metals, minerals, coal)		652 230 225
Mining operations (structural materials)		66 771 452
Repair expenditures		252 156 755
Total		1 713 266 570

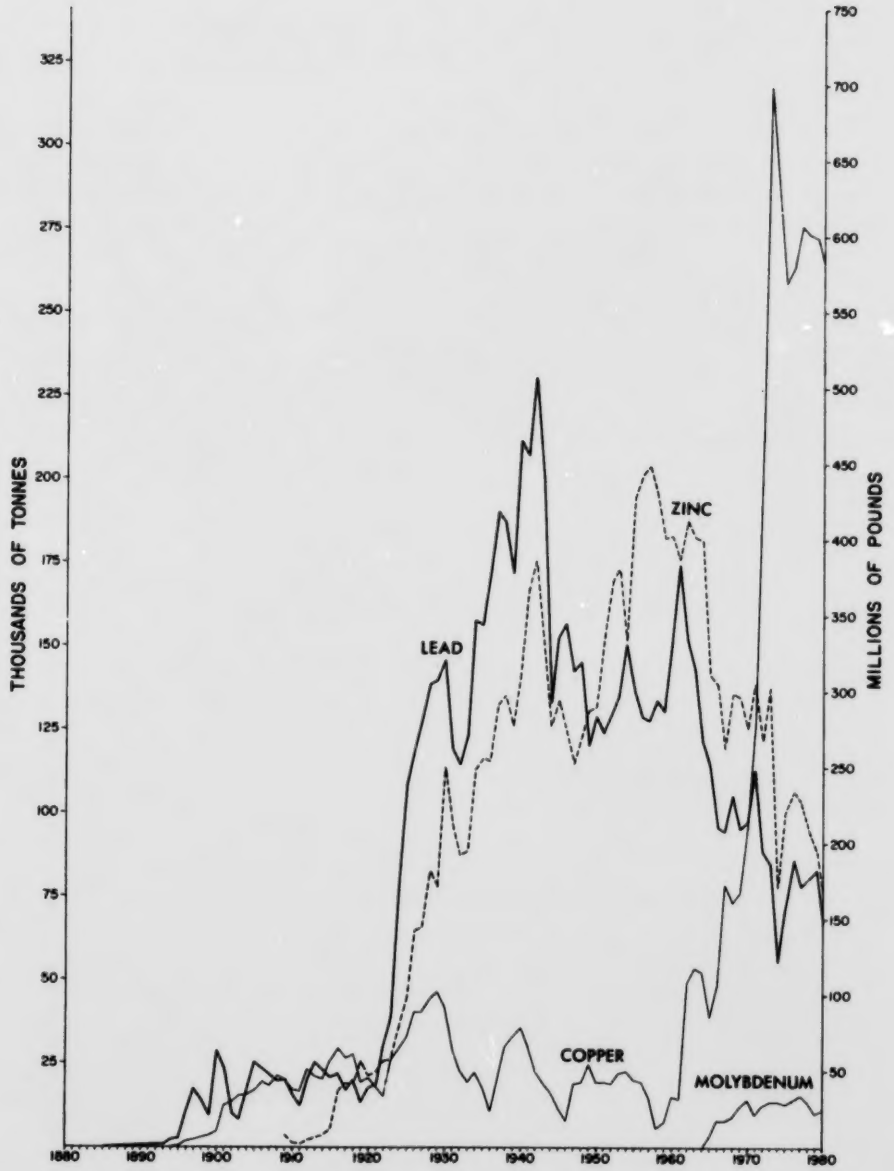


Figure 1-5—Quantities of major metals produced, 1885–1980.

Mines in British Columbia Which Produced More than 1 000 Tonnes of Ore in 1980

Name of Mine	Products	NTS Location	Rated Capacity of Mill/Cleaning Plant (Tonnes/Day)	Mine[1] Type	Name of Company	Company Address	Mine Address
Metal Mines							
Horn Silver	Ag, Pb, Zn, Cu	82E/4E	140	U	Dankoe Mines Ltd.	2002, 1177 West Hastings St., Vancouver V6E 2L6	Box 190, Kereneos.
Highland Bell	Ag, Zn, Pb, Au, Cd	82E/6E	110	U	Teck Corp. Ltd.	1199 W. Hastings St., Vancouver V6E 2K5	Beaverdell V0H 1A0.
Gold Belt	Au, Ag, Cu, Pb, Zn	82F/3E	.....	U	Goldbelt Mines Inc.	507, 318 Homer St., Vancouver V6B 2V3	Box 549, Salmo V0G 1Z0.
Utica	Au, Ag, Pb, Zn	82F/14E	.....	U	David Minerals Ltd.	1020, 475 Howe St., Vancouver V6C 2B3	Box 634, Kaslo.
Arlington	Au, Ag, Cu, Pb	82F/14W	.....	U	Edward Shukin	Box 247, Slocan V0G 2C0	Slocan.
Silmonac	Zn, Pb, Ag, Cd	82F/14	140	U	Kam-Kotia Mines Ltd. and Silmonac Mines Ltd.	420, 475 Howe St., Vancouver V6C 2B3	Box 189, New Denver.
Sullivan	Zn, Pb, Ag, Cd	82G/12W	9 500	U	Cominco Ltd. (Sullivan mine)	200 Granville Square, Vancouver V6C 2R2	Box 2000, Kimberley V1A 2G3.
Lynx, Myra	Zn, Cu, Ag, Pb, Au, Cd	92F/12E	900	O	Western Mines Ltd.	1103, Box 49066, 595 Burrard Street, Vancouver V7X 1C4	Box 8000, Campbell River.
Similkameen	Cu, Ag, Au	92H/7E	13 600	O	Similkameen Mining Co. Ltd.	14th Floor, 750 W. Pender St., Vancouver V6C 1K3	Box 520, Princeton V0X 1W0.
Brenda	Cu, Mo, Ag	92H/16E	22 000	O	Brenda Mines Ltd.	Box 420, Peachland V0H 1X0	Box 420, Peachland V0H 1X0.
Craigmont	Cu	92I/2W	4 860	U	Craigmont Mines Ltd.	700, 1030 W. Georgia St., Vancouver V6E 3A8	Box 3000, Merritt.
Lornex	Cu, Mo, Ag, Au	92I/6E	40 900	O	Lornex Mining Corp. Ltd.	510, 580 Granville St., Vancouver V6C 1W8	Box 1500, Logan Lake V0K 1W0.
Bethlehem	Cu, Ag, Au	92I/7W	16 800	O	Bethlehem Copper Corp.	2100, 1055 W. Hastings St., Vancouver V6E 2H8	Box 520, Ashcroft.
Afton	Cu	92I/10E	6 350	O	Afton Mines Ltd.	1199 W. Hastings St., Vancouver V6E 2K5	Box 937, Kamloops.
Warman	Au, Ag	92J/3E	426	U	Northair Mines Ltd.	333, 885 Dunsmuir St., Vancouver V6C 1N5	Squamish.
Island Copper	Cu, Mo, Ag, Au	92L/11W	34 500	O	Utah Mines Ltd.	1600, 1050 W. Pender St., Vancouver V6E 3S7	Box 370, Port Hardy V0N 2P0.
Boss Mountain	Mo	93A/2W	1 590	U	Noranda Mines Ltd. (Boss Mt. Div.)	1050 Davie St., Vancouver V6B 3W7	Hendrix Lake.
Gibraltar	Cu, Mo, Ag	93B/9W	36 330	O	Gibraltar Mines Ltd.	700, 1030 W. Georgia Street, Vancouver V6E 3A8	Box 130, McLeese Lake V0L 1P0.
Mosquito Creek	Au	93H/4E	110	U	Mosquito Creek Gold Mining Co. Ltd.	Box 6080, Calgary, Alta. T2P 2E7.	Box 10, Wells V0K 2R0.
Endako	Mo	93K/3E	24 500	O	Placer Development Ltd. (Endako Div.)	800, 1030 W. Georgia Street, Vancouver V6E 3A8	Endako.
Granisle	Cu, Ag, Au	93L/16E	12 260	O	Granisle Copper Ltd.	17th Floor, 1050 W. Pender St., Vancouver V6E 2H7	Box 1000, Granisle.
Bell (Newman)	Cu, Au	93M/1E	11 800	O	Norando Mines Ltd. (Bell Copper Div.)	1050 Davie St., Vancouver V6B 3W7	Box 2000, Granisle.
Tasu	Fe, Cu	103C/16E	7 300	O	Wesfrob Mines Ltd. (Tasu)	500, 1112 W. Pender St., Vancouver V6E 2S3	Tasu.
Goat Ridge	Ag	104A/4E	.....	U	Nor-Quest Resources Ltd.	2231-G McGarrigle Rd., Nanaimo V9S 4M5.	
Erickson	Au, Ag	104P/4E	136	U	Erickson Gold Mining Corp.	203, 1209 E. Fourth St., North Vancouver V7J 1G8	Cassiar.
Industrial Mineral Open Pits and Quarry							
Torrent	Barite	82G/13W	.....	U	Mountain Minerals Ltd.	Box 700, Lethbridge, Alta.	Box 603, Invermere.
Western Gypsum	Gypsum	82J/5W	2 450	O	Westroc Industries Ltd.	Box 5638, Postal Station A, Calgary, Alta. T2H 1Y1	Box 217, Invermere V0A 1K0.
Mineral King	Barite	82K/8W	Small	O	Mountain Minerals Ltd.	Box 700, Lethbridge, Alta.	Box 603, Invermere.
Brisco	Barite	82K/16W	.....	U	Mountain Minerals Ltd.	Box 700, Lethbridge, Alta.	Box 603, Invermere.
Parsons	Barite	82N/2E	.....	U	Mountain Minerals Ltd.	Box 700, Lethbridge, Alta.	Box 603, Invermere.
Cassiar	Asbestos	104P/5W	3 630	O	Cassiar Asbestos Corp. Ltd.	2000, 1055 E. Hastings St., Vancouver V6E 3V3	Cassiar V0C 1E0.
Coal Mines							
Byron Creek (Corbin)	Coal	82G/10E	1 700	O	Byron Creek Collieries Ltd.	Box 270, Blairmore, Alta.	Box 270, Blairmore, Alta.
Kaiser (Harmer Ridge: Balmer North and Hydraulic)	Coal	82G/10, 15	28 000	O, U	Kaiser Resources Ltd.	1500 W. Georgia St., Vancouver V6G 2Z8	Box 2000, Sparwood.
Fording (Clode Creek and Greenhill)	Coal	82J/2W	17 000	O	Fording Coal Ltd.	200, 205 Ninth Ave. SE., Calgary, Alta. T2G 0R4	Box 100, Elkford V0B 1H0.
Coleman (Tent Mountain)	Coal	82G/10W	.....	O	Coleman Collieries Ltd.	Box 640, Coleman, Alta.	Tent Mountain T0K 0M0.

[1] O—Open pit. U—Underground.

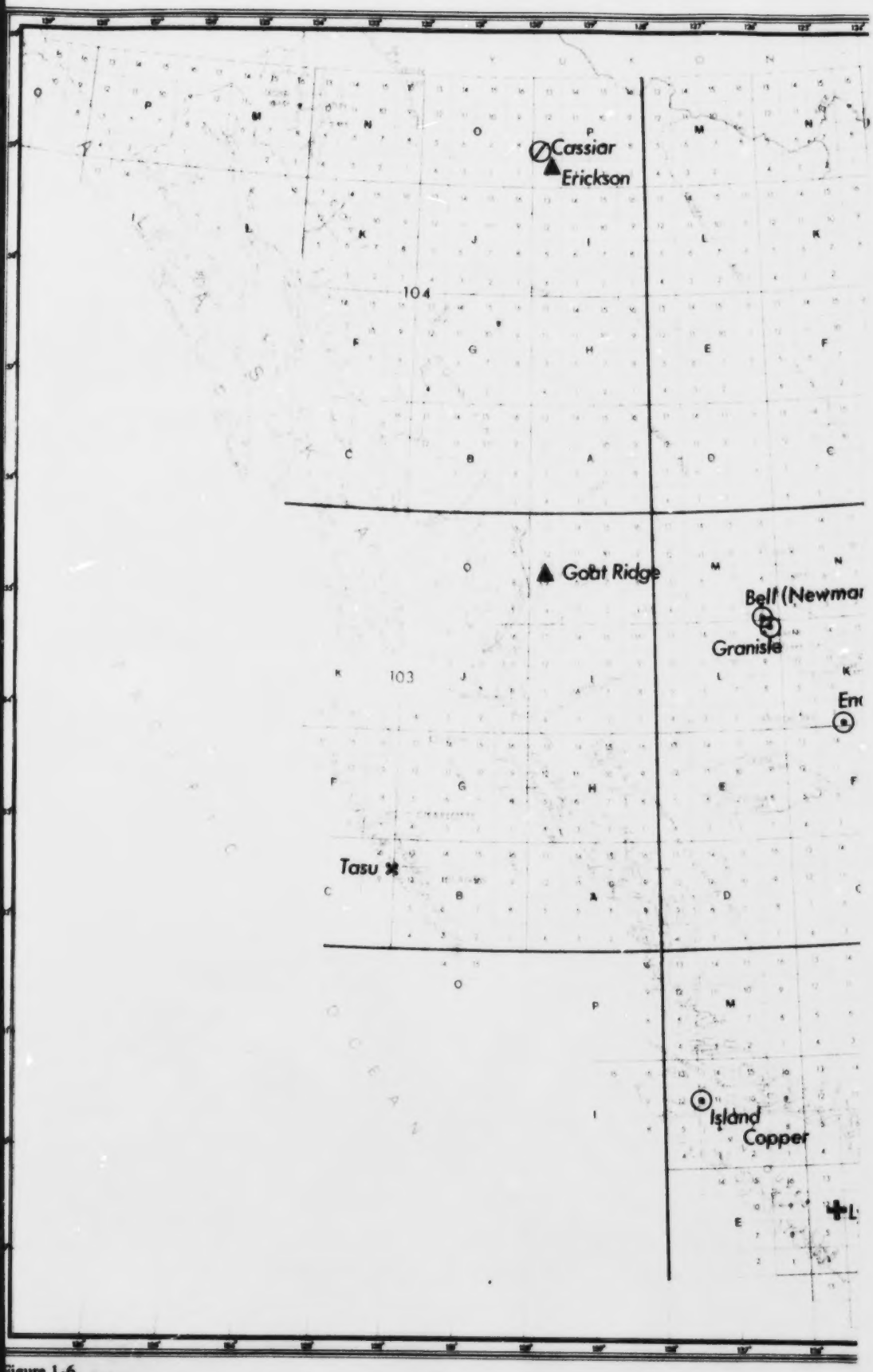

Cassiar
Erickson
104
Gabbt Ridge
Bell (Newmar
Granisle
103
Tasu
Island
Copper

Figure 1-6.

BRITISH COLUMBIA

MAJOR MINES, 1980

Metal Mines

Geological Class	Underground Mine	Other
PORPHYRY Cu, Mo	●	○
SKARN Cu, Fe	✕	⊗
MASSIVE SULPHIDE Zn, Cu, Pb	✚	⊕
STRATIFORM Pb, Zn, Ag	■	□
OTHER	▲	△

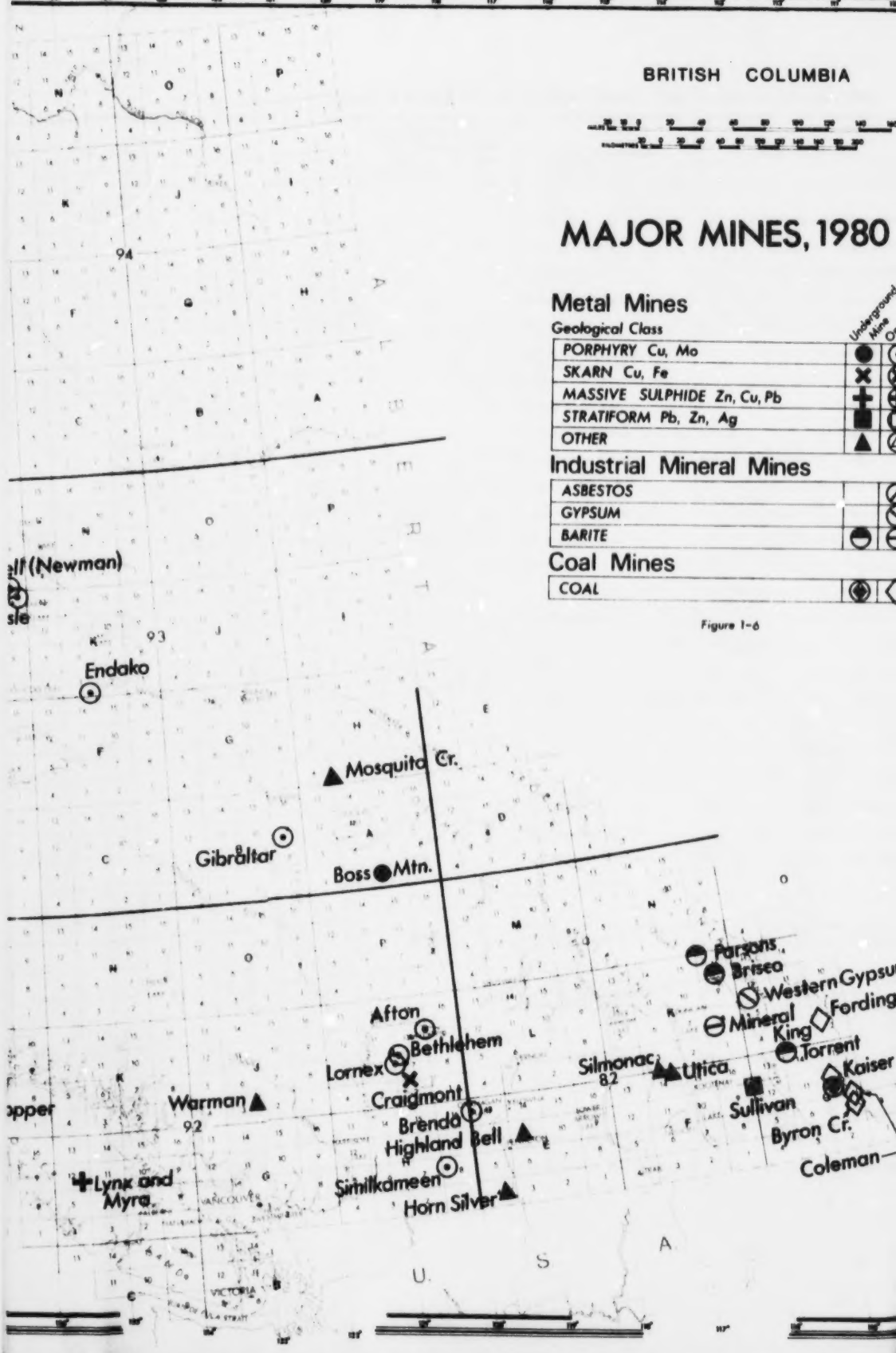
Industrial Mineral Mines

ASBESTOS		⊘
GYPSUM		⊘
BARITE	◓	⊖

Coal Mines

COAL	◈	◇

Figure 1-6



MINING AND TREATMENT

Metal Mines

Metal mining in 1980 was subject to a number of conflicting trends and influences but in most respects was a banner year with new highs in production value, capital investment, exploration, and job creation. At the same time, production quantity fell slightly and some softening in metal prices was evident at the end of the year. The total value of metals produced was $1.429 billion, a new record, up 5.8 per cent from 1979.

In 1980, 65 mines produced 93 432 843 tonnes, an increase of 19.4 per cent over the 85 410 000 tonnes produced by 62 mines in 1979. Of the 65 mines, 23 produced more than 1 000 tonnes of ore in the year; the others were minor producers. There were few changes among the mines producing over 1 000 tonnes; three Slocan mines dropped below 1 000 tonnes or ceased producing and the Mosquito Creek, the OK, and the Goat Ridge mines started up. The OK was a former lode copper producer, Mosquito Creek is a new gold vein producer, a continuation of the old Aurum (Island Mountain) vein system, and Goat Ridge is a former silver vein producer.

In 1980, 12 mines produced more than 1 000 000 tonnes. These large mines produced an aggregate of 91 359 081 tonnes or 97.8 per cent of the total tonnes mined. Tasu produced just under 1 000 000 tonnes in 1980, otherwise the large mines are identical. Of the 12 large mines, 10 are open-pit porphyry copper and/or molybdenum mines. These are in order of magnitude: Lornex, Island Copper, Gibraltar, Endako, Brenda, Similkameen, Bethlehem, Bell, Granisle, and Afton. Lornex is in the process of expansion to become the largest metal mine in Canada. The other two large mines are Sullivan and Craigmont; both are underground mines and are respectively a shale-hosted stratiform lead/zinc/silver mine and a skarn copper/iron mine.

Three intermediate-sized mines (beween 100 000 and 1 000 000 tonnes) operated in 1980, the Tasu, Boss Mountain, and Lynx and Myra, in order of magnitude. All are at present underground mines although Boss Mountain also produces from a small open pit. Tasu is a iron/copper skarn mine, the Lynx and Myra are adjacent mines on a single polymetallic massive sulphide deposit, and Boss Mountain is a porphyry molybdenum mine. The aggregate of these mines was 1 807 920 tonnes or 1.9 per cent of the total.

Eight small mines produced between 1 000 and 100 000 tonnes each a year. This is the same number as in 1979 but there has been a change in the list, three new ones being described previously and the Arlington, Scranton, and Gold Belt dropping out. These mines, in order of magnitude, are Warman, OK, Highland Bell, Silmonac, Erikson, Horn Silver, Mosquito Creek, and Goat Ridge. The aggregate tonnage was 259 881, or only 0.3 per cent of the total.

Concentrating

All the major mines (>1 000 tonnes per year) have operating concentrators. The products of these concentrators is shown in Table 3-12 and in condensed form is as follows:

- Four—copper concentrates
- Five—copper and molybdenum
- Seven—lead-zinc (silver-gold)
- Two—molybdenum
- Two—copper-iron
- One—copper-lead-zinc
- One—silver
- One—gold

Smelting and Refining

Further processing and production of metals in British Columbia differs greatly according to the commodity. Most of the lead-zinc concentrates produced in the province

are smelted and refined at the Trail smelter of Cominco Ltd. This plant is being modernized to improve productivity and environmental aspects. Only a minor portion of the copper concentrates produced in the province are smelted here, those produced by the Afton mine are treated in their top-blown rotary converter producing blister copper. Some molybdic trioxide and ferromolybdenum and moly lubricant are produced at the Endako mine plant. Gold is treated differently at different mines; the Warman plant produces dore bars, Mosquito Creek produces bullion, and the Erikson produces concentrates.

The Trail smelter received 115 714 tonnes of lead concentrates and 94 518 tonnes of zinc concentrates from the Sullivan mine as well as 8 403 tonnes of lead concentrates and 17 537 tonnes of zinc concentrates from other British Columbia mines. In addition, the smelter received concentrates from Pine Point Mines in the Northwest Territories, and a number of custom sources outside the province, as well as scrap. The total value of concentrates from British Columbia treated at Trail, including by-product metal, was $224 096 090 or 15.7 per cent of the metal produced in the province in 1980.

Endako shipped products containing 4 651 559 kilograms of molybdenum, including 376 tonnes of molybdenite concentrates, 7 284 tonnes of molybdic trioxide, and 163 tonnes of ferromolybdenum.

The Afton smelter produced 22 510 tonnes of blister copper.

Destination of Concentrates or Metals

The proportion of the total value of metal production going to various destinations is not known accurately but is approximately as follows:

	Million $	*Per Cent*
Smelted or treated in British Columbia	31.8	22.3
Shipped to other parts of Canada	84.1	5.9
Exported to Japan	637.1	44.6
Exported to the United States	76.5	5.4
Exported to Europe	258.7	18.0
Unattributed	54.2	3.8

The destination of concentrates of the major metals is shown in detail in Tables 3-13a and 3-13b. Copper concentrates produced in British Columbia were shipped to the following destinations:

	Tonnes
Canada	66 109
Japan	632 162
Spain	86 863
Elsewhere	87 902

Details of molybdenum disposition (11 209 501 kilograms valued at $228 934 398) are not precisely ascertainable but from known sales appear to be as follows:

	Per Cent
Europe	44
United States	17
Japan	30
Other countries and eastern Canada	9

Zinc concentrates produced in British Columbia but not smelted here totalled 19 118 tonnes, all of which were shipped to the United States.

Iron concentrates produced in British Columbia were sold to the following markets:

	Tonnes
Japan	520 515
Australia	52 675
Canada	80 134

All lead concentrates produced in British Columbia in 1980 were shipped to the Trail smelter.

Non-metallic Mines

Industrial minerals in British Columbia with production value greater than $1 million include asbestos, sulphur, gypsum, jade, barite, and granules (*see* Table 1-1). Asbestos is by far the most important; its production value of 81.7 million represents 70 per cent of the total for all industrial mineral production. Asbestos production is entirely from the Cassiar mine. Sulphur is produced entirely as a by-product, chiefly from Cominco Ltd.'s roasting operations, but also from sour gas production in the Peace River. Gypsum is produced chiefly at the Windermere quarry at Westroc Industries Limited (751 067 tonnes). Granules are produced in many small quantities but production was dominated by the International Marble & Stone Company Ltd., with a plant at Sirdar near Creston. In 1980 production of jade again exceeded $1 million. Production came from many sources but the main mines are working *in situ* nephrite at Provencher Lake (Primex Exploration Ltd.) and east of Dease Lake (Cry Lake Minerals Ltd.).

Barite, an important industrial mineral, not specifically listed in Table 1-1, was produced by Mountain Minerals Limited from three small underground mines near Brisco, Parson, and Torrent and tailings from the Mineral King mine at Toby Creek, all in the East Kootenays.

A company controlled by Hanna Mining Company started providing silica for glass from the Wonah quartzite at the Hunt property near Golden. Production will be at 20 000 tonnes per year.

The dominant structural materials produced are sand and gravel, cement, limestone, clay products, and riprap and crushed rock. Individual mines and quarries are not shown on Figure 1-6. Many of these products are produced at a large number of small quarries, some of which have very intermittent production. Limestone production is dominated by four mines (Ideal, Imperial, Vananda, and Domtar) on Texada Island. Significant operations are also located at Harper Ranch near Kamloops (Canada Cement Lafarge Ltd.), Ptarmigan Creek near Quesnel (Quesnel Redi-Mix Cement Co. Ltd.), and Pavilion Lake (Steel Brothers Canada Limited).

Clay and shale production in British Columbia is dominated by Clayburn Industries Ltd.'s pit and plant near Abbotsford, with lesser production by Haney Brick and Tile Limited, east of Haney.

Coal Mines

Coal is the third most valuable mineral commodity in British Columbia, following copper and natural gas and improved its position *vis-a-vis* these products in 1980. Although coal is widely distributed in the province, the major producing mines are at present concentrated in the Crowsnest Coalfield of southeast British Columbia. They are represented by five symbols on Figure 1-6 for (1) Fording Coal Limited's two open pits, (2) Kaiser Resources Ltd.'s open-pit complex (Harmer Ridge), (3) Kaiser's two underground mines (Balmer North and Hydraulic), (4) Coleman Collieries Limited's Tent Mountain open pit mine, and (5) Byron Creek Collieries Limited's open pit. The only other producing coal mine is Bulkley Valley Collieries Limited's mine at Telkwa which was a very minor producer of thermal coal. Production for Kaiser's and Fording's mines is

consolidated in Table 3-8B so that only five operations are shown. Kaiser Resources Ltd. and Fording Coal Limited produced 86 per cent of the coal mined in the province in 1980.

Some salient facts about coal production in 1980 are as follows:

- Coal production was up significantly to 10 823 530 tonnes, a new record, 2 per cent above 1979.
- Clean coal output was 10 156 225 tonnes in 1980.
- The value of coal sold and used was $461 492 857, up 5 per cent to a new record.
- About 95 per cent of raw coal produced in 1980 comes from surface mining operations, virtually unchanged since 1979.
- About 91 per cent of raw coal produced was metallurgical coal.
- The percentage of clean to raw coal was 72 per cent.

The diversification of markets started in 1977 and has continued. Although coal sales to Japan were over 7.7 million tonnes, they now represent only 72 per cent of total production. Major shipments were as follows:

	Tonnes
Korea	980 058
Brazil	289 443
Greece	258 337
Denmark	252 171
Taiwan	210 771
Chile	134 171
Sweden	84 343
Spain	47 825
Netherlands	42 310
Mexico	28 485
Pakistan	24 409
United States	1 282

Shipments within Canada totalled 668 508 tonnes, down slightly from 1979. Ontario received 551 309 tonnes; Manitoba, 60 064; Alberta, 400 tonnes. Use in British Columbia for coke production was 131 856 tonnes, down 17.5 per cent. Other uses in British Columbia, mostly thermal, dropped slightly to 56 735 tonnes.

EXPLORATION AND DEVELOPMENT

The mineral industry in 1980 experienced a major surge in development and exploration effort. Developments were initiated or in train that will most likely double the size of the industry before the middle of the decade. In 1980 new development took place at all scales of activity ranging from large low-grade porphyry deposits developed by large national and multinational companies to junior gold producers with 50 to 100 tonnes per day underground operations. Exploration by all indices was up 30 to as much as 80 per cent over 1979, reaching levels well above those of the previous peaks in the late sixties and early seventies. This effort was mounted even though uranium exploration and development was subject by Order in Council to a seven-year moratorium early in March of 1980.

Development Highlights

Metals

Important developments occurred throughout the province as is shown by the distribution on Figure 1-7. The Highland Valley was the focus of the largest new developments in 1980. Teck Corporation's Highmont mine was virtually ready for production at the end of the year with a rated capacity of 22 700 tonnes per day. It will be the third largest mine in the Highland Valley. Lornex mine's expansion to 72 600 tonnes per day was well underway and this will make it Canada's largest base-metal mine. Cominco Ltd. acquired control of Bethlehem Copper Corporation and reactivated studies concerning the valley copper deposit. The OK mine of DeKalb Mining Corporation was rehabilitated and began production at 500 tonnes per day. Another porphyry deposit, Kitsault, on the north coast of Alice Arm is being rehabilitated and prepared for production in 1981.

Junior gold mines are emerging as a major component of the province's mining industry, reflecting the high prices for precious metals and the relatively short lead time to bring some vein properties into production. Carolin Mines Ltd. is developing a 1 360-tonne-per-day underground bulk gold operation in the Coquihalla area near Hope that is scheduled for operation in 1981. DuPont of Canada Exploration Limited is developing the Baker mine (Chappelle) epithermal high-grade gold-silver deposit in the remote Toodoggone area (94E) supported largely by air transport. The 90-tonne-per-day mill is scheduled for production early in 1981; a small open pit will start the operation which otherwise will be underground. Mosquito Creek Gold Mining Company Limited poured its first gold brick in mid-1980, the first production from the Wells camp since 1967. The operation is at the northwest end of the favourable belt that included the Cariboo Gold Quartz and original Island Mountain mines. It also is an underground operation and has an 80-tonne-per-day mill. Scottie Gold Mines Ltd. is developing, at a capital cost of $19 million, its Morris Summit gold-silver deposit near Stewart. Pre-production underground development of a 100-metre adit and underground mill is underway. A 140-tonne-per-day operation for 1981 is planned. In northern British Columbia at Cassiar, Nu-Energy Corporation is planning to double its production rate to 180 tonnes per day at its Erickson gold mine. The capital cost will be $450 000. Close by, United Hearne Resources Ltd./Taurus Resources Ltd.'s high-grade Hanna gold deposit has a good chance of being brought back into production. More than $500 000 has been spent on surface and underground exploration and development. The 1981 program has a budget of $2 million. Nearby on the Vollaug vein (Silver Standard, Table Mountain Mines Limited) has made an agreement with Plaza Mining Corporation in which Plaza has right of first refusal to the Vollaug ore. Plaza is developing an extension of the Vollaug vein and has recently let a contract to construct a mill. In addition, near Houston the Sam Goosly property of Equity Silver Mines Ltd., controlled by Placer Development Limited, was

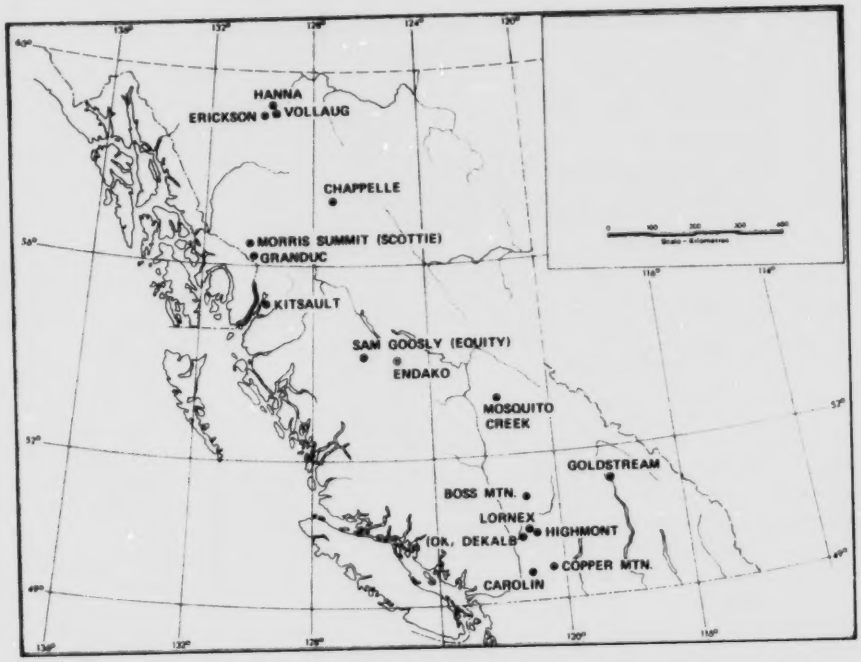


Figure 1-7 — New and expanding mines.

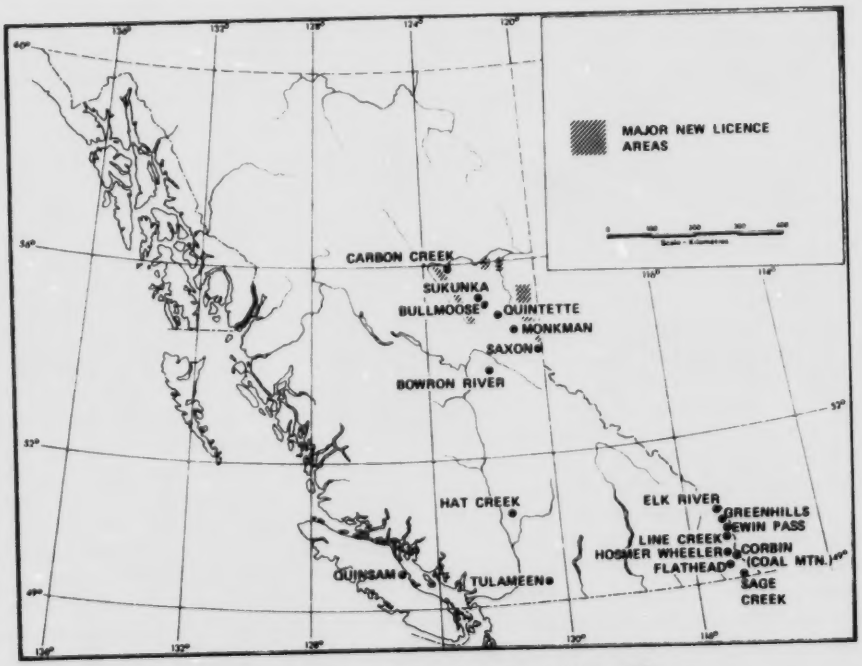


Figure 1-8 — Coal potential producers, 1980–1990.

producing unleached concentrates at the end of 1980 although the leach plant will not be ready until well into 1981. This enigmatic silver-copper deposit will operate at 4 500 tonnes per day and have a major impact in the silver production of the province.

Two polymetallic massive sulphide deposits were also under development in 1980. The Granduc mine at Stewart was being rehabilitated by Canada Wide Mines Ltd. (Esso Minerals) with a planned production of 3 600 tonnes per day starting in 1981. The Goldstream deposit north of Revelstoke owned by Noranda Mines, Limited is being prepared for production in late 1982 at 1 350 tonnes per day.

Another major development is the continuing modernization of the Sullivan mine and the smelter complex at Trail by Cominco Ltd. at a cost of $420 million.

Non-metallic Minerals

Some developments in non-metallic minerals were also of importance. Mountain Minerals Limited developed its underground barite deposit at Brisco south of Golden. This company is also developing, at Mount Moberly, a silica property on the Wonah (Mount Wilson) quartzite similar to Hanna Mining's new property.

Coal

Major new coal developments were also underway or proposed in 1980 (*see* Fig. 1-8). The major actual developments were in the Crowsnest Coalfield in the southeast but negotiations were at an advanced stage in regard to developing two mines in the Peace River Coalfield. Also British Columbia Resources Investment Company purchased controlling interest in Kaiser Resources Ltd., the largest coal mine complex in the province.

New mines and major expansions are under development in the southeast to meet the new or expanded markets in Japan and Korea. Crows Nest Resources Ltd. is developing the Line Creek mine, an open-pit operation 19 kilometres north of Sparwood. It is expected to produce 1 million tonnes per year metallurgical coal and 68 000 tonnes per year thermal coal. The target completion date is 1982 for thermal coal and mid-1983 for metallurgical coal.

Fording Coal Limited is also expanding its operation at Elkford with a first-stage pit expansion targeted for completion by mid-1981. Kaiser Resources Ltd. is developing the Greenhills mine, an open-pit operation 35 kilometres north of Sparwood. It is planned to produce 1.65 million tonnes per year by 1982. The coal terminal at Roberts Bank near Vancouver is being expanded to meet this increased production.

If negotiations underway in 1980 with the Japanese steel industry are successful, then several new coal mines in northeastern British Columbia will be developed including the Denison Mines Limited's Quintette and Teck Corporation's Bullmoose deposits.

EXPLORATION

Exploration for solid minerals in 1980 also reached a new peak, up nearly 53 per cent over 1979, which in turn was 50 per cent more than 1978. The main surge was in the search for precious metals, molybdenum, tin, and tungsten, and shale-hosted lead-zinc-barite deposits. Non-metallic exploration was also up although coal exploration was down.

Metals

Metals exploration was up 72.5 per cent over 1979 to reach levels of effort probably well above that of the late 1960's during the porphyry exploration boom. The indices used to measure exploration effort, shown in Table 1-5, are all up substantially, most of them to new highs. Exploration was widely distributed throughout the province and varied from

major grassroots regional programs to detailed re-examination of known prospects or past producing mines.

Table 1-5—Indices of Metal Exploration

	1976	1977	1978	1979	1980
	$	$	$	$	$
Exploration expenditure[1]	27 183 927	26 177 389	29 475 341	53 810 829	92 850 714
Claims recorded (unit modified grid system)	28 970	37 151	37 242	55 252	72 349
Certificates of work	36 729	39 711	65 705	76 233	141 142
Free miners' certificates:					
Individual	7 826	7 566	9 444	14 591	18 840
Companies	555	520	531	643	994
Number of properties	433	564	647	781	1 562
Total drilling (metres)[2]	97 277	110 303.6	154 177	216 962	412 995
Total geophysical surveys (kilometres)[2]	4 267	14 623.5	9 135.5	27 520	19 228

[1] Compiled by Mineral Economics Division.
[2] Compiled by Geological Division.

Precious metals were the focus of most attention. In the Queen Charlotte Islands the Babe (Cinola) gold deposit has advanced through the preliminary feasibility stage. A 500-metre decline and crosscuts have been driven to allow underground drilling to commence. Pilot plant milling of the ore is planned. Consolidated Cinola Mines Ltd. and its partner Energy Reserves Canada Limited have announced reserves of 43 million tons of 0.054 ounce per ton gold. This Carlin-like deposit is estimated to contain at least 2.5 million ounces of micron-sized gold.

In the southern Coast Mountains, Northair Mines Ltd./Brandy Resources Inc. carried out a major underground program on the Silver Tusk property, Silver Tunnel zone on Brandywine Creek, in an effort to locate additional gold-silver reserves to extend Northair's (Warman) operation a few kilometres to the north. Also Bralorne Resources Limited and E&B Explorations Ltd. have formed a joint venture to re-examine the old Bralorne mine west of Lillooet with the intent of re-opening this former underground gold producer.

In the northern Coast Mountains at Alice Arm area, Dolly Varden Minerals Inc. has initiated a $1.2 million program to re-open three silver mines, the North Star in 1981 followed by Wolf 1 and 2. During 1980, underground development was carried out on the North Star and drilling on Wolf 1. Engineering and environmental studies are also well underway. In the Stewart area, the Big Missouri gold-silver deposit was again extensively tested with favourable results by underground drilling (44 holes) by Western Mines Limited under agreement with Tournigan Mining Exploration Ltd. Also Silbak Premier Mines Ltd. has committed approximately $750 000 to an underground exploration program aimed at re-opening that former gold-silver mine.

In the northern Intermontane Belt, Serem Ltd. conducted a successful drilling program (18 holes) on the Lawyers gold-silver deposit adjoining DuPont of Canada Exploration Limited's Baker mine in the Toodoggone River area. As a result of these two successes, intense exploration effort is planned in the area for epithermal gold deposits in 1981.

In the southern interior near Clinton, Blackdome Exploration Ltd. has completed another year's drilling (100 holes) on its small but high-grade gold-silver prospect.

Shale-hosted lead-zinc-barite deposits in the northern Rocky Mountains were one of the principal exploration targets again in 1980. Major drilling was undertaken at the Cirque (Cyprus Anvil Mining Corporation/Hudson's Bay Oil and Gas Company Limited) and Driftpile (Gataga Joint Venture) deposits. Estimated reserves for the Cirque deposit are 30 million tons of 7.9 per cent zinc, 2.3 per cent lead, and 1.5 ounces per ton silver. It appears that these deposits are of sufficient size and grade to be developed in the late 1980's, despite the remote location and lack of infrastructure.

Porphyry deposits were still a target of major exploration with the emphasis on molybdenum and precious-metal-bearing ones. In the Coast Mountains there were major drilling programs (53 holes) by Craigmont Mines Limited on the Red Bird molybdenum deposit and on the Redcap of Omni Resources Inc., a molybdenum-tungsten deposit at Mount Ogden near Tulsequah. The 20th Century Energy Corporation carried out extensive drilling of their porphyry copper-molybdenum deposit on Gambier Island in Howe Sound.

In the northern interior near Dease Lake, Nuspar Ltd. and Esso Minerals Canada Limited did further drilling on the Eaglehead copper property. Reserves are approximately 30 million tonnes of 0.4 per cent copper. Shell Canada Resources Ltd. drilled the Storie molybdenum deposit at Cassiar. Texasgulf Canada Ltd. did further drilling on its Boya tungsten-molybdenum property near the Kechika River. A major drilling program (35 holes) was conducted on the Schaft Creek copper-molybdenum deposit by Teck Corporation with partners Silver Standard Mines Ltd. and Liard Copper Mines Ltd.

In the southern interior, Vestor Explorations Ltd. and Union Oil Company of Canada Ltd. completed six deep holes on the Carmi molybdenum deposit which show that the Lake zone extends 330 metres below surface. Also Long Lac Mineral Exploration Ltd. carried out an aggressive exploration program in excess of $1 million on its Poison Mountain copper-gold-molybdenum property. Extensive drilling and metallurgical and feasibility studies are underway.

Summary of Major Exploration Activity

The increase in mature exploration programs is best shown by the fact that 33 properties completed programs exceeding 3 000 metres of drilling or 300 metres of underground development which has been used as a criteria of a major program. This contrasts with 16 in 1979 and 9 in 1978.

MAJOR EXPLORATION ACTIVITY, 1980

SMRB, KUTCHO (Sumac Mines Ltd.), 104I/1W—massive volcanogenic pyritic copper and zinc sulphide bodies occurring in sericite quartz schist; 3 792 metres of diamond drilling in 23 holes.

JEFF (Esso Resources Canada Ltd.), 104I/1W, 2E—massive sulphide deposits in volcanic rocks; 4 491.2 metres of diamond drilling in 4 holes plus wedged holes.

ADANAC, ADERA (Adanac Mining and Exploration Ltd.), 104N/11W—molybdenum porphyry deposit in fractures and quartz veins in members of the Surprise Lake batholith; 4 858.5 metres of diamond drilling in 27 holes.

LIARD COPPER, NABS (Teck Explorations Limited), 104G/6E, 7W—copper and molybdenum porphyry deposit in highly altered andesitic pyroclastic and porphyry dyke rocks; 14 522.5 metres of diamond drilling in 45 holes.

KLASTLINE, KONA (Newhawk Gold Mines Ltd.), 104G/9W—gold in quartz veins with pyrite, sphalerite, and arsenopyrite; 665.0 metres of underground development (underground adit 235 metres and underground diamond drilling 430 metres).

CORNUCOPIA, TAURUS (Taurus Resources Ltd.),104P/5E—gold with pyrite in fractures cutting andesite and tuffs of the Sylvester Group of Devonian age; 343.1 metres of underground development.

NABS, BIRD, SNO, HICKS (Teck Corporation), 104G/6E, 7W—chalcopyrite, bornite, and molybdenite in strongly fractured pyroclastic rocks (Late Triassic age); 14 513.23 metres of diamond drilling in 45 holes.

STORIE (Casmo Mining Ltd.), 104P/4W—molybdenum porphyry deposit in quartz monzonite stock that lies along the eastern contact of the Cassiar batholith; 5 940 metres of diamond drilling in 21 holes.

SCOTTIE, SALMON GOLD (Scottie Gold Mines Ltd.), 194B/1E—gold, mainly associated with pyrrhotite-rich lenses occurring along northwest-striking faults and easterly striking faults; 2 347 metres of tunnelling.

GOAT, KEN, NORDORE (Nor-Quest Resources Ltd. and Guaranty Trust Co. of Canada Ltd.), 104A/4E—silver, gold, lead, zinc, and iron in carbonate and quartz vein systems located on the east flank of the Coast Range batholith of Jurassic/Cretaceous age; 300 metres of underground development.

ROBB LAKE (Texas Gulf Canada Ltd.), 94B/13—lead and zinc mineralization in dolomitized Devonian carbonate rocks; 3 502.7 metres of diamond drilling in 10 holes.

ELF (Cyprus Anvil Mining Corporation), 94F/7—bedded barite, lead, zinc, and silver with black shales of the Gunsteel Formation; 4 101 metres of diamond drilling in 10 holes.

CIRQUE (Cyprus Anvil Mining Corporation), 94F/6E, 11E—massive stratiform barite-pyrite-sphalerite-galena deposits in black shales of the Upper Devonian Gunsteel Formation; 10 592 metres of diamond drilling in 27 holes.

BABE (Consolidated Cinola Mines Ltd.), 103F/9W—gold in rhyolite and silicified sedimentary rocks adjacent to the Sandspit fault system; 10 000 metres of diamond drilling in 70 holes.

EDYE PASS, SURF POINT (Banwan Gold Mines Ltd.), 103J/2E—pyrite and chalcopyrite quartz veins containing gold and silver; 3 472 metres of underground diamond drilling in 50 holes and 409 metres of underground development.

DOLLY VARDEN (Dolly Varden Minerals Inc.), 103P/12E—silver and lead mineralization in a vein-shaped replacement deposit occurring in fragmental volcanic rocks of the Hazelton Group; 1 064.9 metres of underground development.

RED BIRD (Ashfork Mines Limited), 93E/6E, 7W—molybdenum porphyry deposits with mineralization around the periphery of a Tertiary quartz monzonite stock; 5 000 metres of diamond drilling in 24 holes.

WHITING CREEK (Kennco Explorations, [Western] Limited), 93E/11, 14E—copper and molybdenum in quartz stockwork in Hazelton hornfels and aplitic quartz porphyry; 2 410 metres of diamond drilling in 8 holes and 1 734 metres of percussion drilling in 22 holes.

CAPOOSE, NED, D (Granges Exploration Aktiebolag), 93F/6E—zinc, lead, silver, and gold in rhyolite; 3 376.1 metres of diamond drilling in 17 holes.

TOPLEY RICHFIELD (RED TOP) (F. B. Whiting), 93L/9W—gold, silver, lead, zinc, cadmium, and copper occur as bedded volcanogenic mineralization within a sequence of layered felsic fragmental volcanic tuffs and andesite of the Hazelton Formation; 5 354 metres of diamond drilling in 28 holes.

AJAX—MONTE CARLO (Cominco Ltd.), 92I/9W—copper mineralization mainly in the form of chalcopyrite in fractures of the Sugarloaf and Hybrid units of the Iron Mask batholith; 14 347 metres of percussion drilling in 190 holes.

MB (20th Century Energy Corp.), 92G/6, 11W—large discontinuous arcuate zone of mineralized rock containing copper, silver, and molybdenum in or near a quartz porphyry stock; 4 121 metres of diamond drilling in 21 holes.

BRANDYWINE, SILVER TUSK (Brandy Resources Inc.), 92J/3E—silver, lead, zinc, and gold mineralization in fractured quartz veins; 4 000 metres of drilling.

POISON MOUNTAIN (Homestake Mineral Development Co.), 92O/2E—copper, molybdenum, gold, and silver in fractures associated with feldspar porphyry intrusive rocks (Tertiary ?) and sedimentary rocks (Jurassic/Cretaceous); 15 277 metres of percussion drilling in 184 holes and 6 803 metres of diamond drilling in 29 holes.

BLACKDOME (Blackdome Exploration Ltd.), 92O/7E, 8W—minor fine-grained pyrite, native gold, and very minor silver sulphosalts in zones of tension fractures; 6 110.2 metres of diamond drilling in 64 holes.

HIGHLANDER (AINSWORTH), UNION, PEANUT BUTTER (David Minerals Ltd.), 82F/10W—copper, lead, zinc, and silver in vein intersections, principally in the Highlander vein system; 3 120.8 metres of diamond drilling in 41 holes.

STEEPLES (CEDAR) (R. H. Standfield), 82G/6, 11W—vein and replacement zones of mineralization containing copper, lead, silver, gold, and zinc in Aldridge and Creston quartzite; 3 934.7 metres of diamond drilling in 4 holes.

CHARLESTON, WELLINGTON, MAYLOWER (Ryan Exploration Co. Ltd.), 82K/3E—lead, zinc, and silver in and near the contact of Slocan sedimentary rocks and Kalso phyllites and schists; 500 metres of underground development.

MOLLIE HUGHES (Denver Silver Inc.), 82K/3W—gold, silver, lead, and zinc mineralization in a vein system within porphyritic granite and granodiorite of the Nelson batholith; 410 metres of underground development.

TROUT LAKE, LUCK, BOY, COPPER CHIEF (Newmont Mines Limited), 82K/12E—molybdenum in stockwork within a small granodiorite plug intruding argillite, phyllite, siliceous schists, and carbonates; 1 305 metres of underground development.

FUKI, DONEN (PNC Exploration Canada Co. Ltd.), 82E/10W—secondary uranium minerals in sandstone-conglomerates concentrated in paleochannels; 6 155.7 metres of diamond drilling in 114 holes.

IDAHO, AURUM (Carolin Mines Ltd.), 92H/11W—gold-silver mineralization in replacement zones in Ladner slates; 2 374 metres of underground development, 2 adits totalling 815 metres and 875 metres, ramp 873 metres.

OK, ALWIN (DeKalb Mining Corporation), 92I/6E—copper, silver, and gold in vertical mineralized alteration zones which lie within homogeneous Bethsaida granodiorite of the Guichon Creek batholith; 1 700 metres of underground development.

Non-metallic Minerals

Non-metallic minerals exploration increased in 1980 to $1.5 million. The major project was one for fluorite at Eaglet Mines Ltd. near Quesnel Lake. An adit was driven 359 metres and 1 659 metres of surface diamond drilling and 2 228 metres of underground drilling were conducted of a large low-grade fluorite deposit. In addition, Baymag Mines Co. Limited carried out surface stripping and bulk sampling of the Mount Brussilof magnesite deposit in the southern Rocky Mountains near Windermere.

Coal

Exploration for coal, at $15.5 million, was down 12.9 per cent in 1980. This is an expected result as programs mature and properties either enter a development phase, are put on hold, or are written off.

Major exploration programs undertaken in 1980 were as follows:

CROWSNEST COALFIELD: In southeastern British Columbia major exploration programs were carried out by Fording Coal, B.C. Coal, and Crows Nest Resources.

Fording Coal drilled 17 diamond and 60 rotary holes for a total of 17 951 metres on their Fording River property. B.C. Coal drilled 1 diamond hole on their Flathead property and drove 2 adits on their Ewin Creek licences. Crows Nest Resources drilled a total of 34 diamond and 24 rotary holes for a total of 9 991 metres. The bulk of their drilling was done on their Lodgepole and Line Creek properties. Crows Nest also dug a number of trenches on their Bare Mountain, Chauncey Ridge, Burnt Ridge, Ewin Pass, Tent, and Corbin licences, a total of 162 for a total of 14 030 metres.

PEACE RIVER COALFIELD: In the northeast, Gulf Canada, Denison Mines, Petro Canada, Canadian Superior MacIntyre Mines, Ranger Oil, Teck Corporation, Utah Mines, and Norco Resources undertook major programs. Gulf drilled a total of 21 diamond holes and 55 rotary holes for a total of 14 097 metres on their Goodrich, Trefi, and Wapiti properties. Denison drilled 12 diamond and 29 rotary holes for a total of 7 224 metres on their Belcourt property. Petro-Canada, Canadian Superior, and MacIntyre Mines drilled 11 diamond and 77 rotary holes for a total of 11 825 metres on their Monkman property (operated by Petro-Canada). Ranger Oil explored further their Mount Spieker property and Teck Corporation drilled 38 diamond and 27 winkie holes for a total of 3 835 metres on their Burnt River property. Utah Mines concentrated their work on South Mount Gething, drilling 2 diamond and 27 rotary holes for a total of 1 505 metres.

BOWON RIVER COALFIELD: Norco Resources drilled 14 holes for a total of 5 295 metres on their Bowron River property.

VANCOUVER ISLAND: Activity on Vancouver Island increased in 1980 with major progress by BP Canada and Esso Resources. Diamond drilling totalled 3 842 metres in 14 holes and rotary totalled 4 572 metres in 17 holes.

Activity of the Mineral Resources Branch

CHAPTER 2

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HISTORY AND DEVELOPMENT

The Mineral Resources Branch has had a long history of development, that started in the mid-nineteenth century as a system of Gold Commissioners and mining recorders to administer placer titles under the Provincial Secretary. In 1874 a Department of Mines was created, gathering together the elements concerned with mining but it was not a truly separate entity. A Bureau of Mines was created by an act of that name in 1895 which initiated the development of the technical elements of the Department, however, the Department did not have a separate Minister and Deputy Minister until the *Department of Mines Act* of 1899. Nevertheless, the Department and its mission evolved from being simply administration of title to one of recording progress of the industry, stimulation of exploration, and safety in quarries and coal and metal mines. In 1953 the Department took over administration of the *Petroleum and Natural Gas Act* and the *Coal Act* from the Department of Lands and thereafter administered title to coal lands as well as coal mine safety. Name changes occurred in 1960 to the Department of Mines and Petroleum Resources and in 1967 to Ministry. In a general realignment of Ministries in December 1978 the mandate was enlarged again to include responsibility for energy matters and it became the Ministry of Energy, Mines and Petroleum Resources. The solid mineral elements of the Ministry form the Mineral Resources Branch, the largest of the three operation divisions.

The Mineral Resources Branch now maintains the tenure records of mineral claims, placer leases, and coal licences; provides the inspection and engineering services for worker and public safety in and around mines; ensures optimum extraction of mineral resources and reclamation of lands disturbed by mining; carries out geoscientific surveys, studies, and compilations to assist and stimulate exploration and maximize access to the land base of the province for exploration; makes analyses for the government respecting the economic conditions, land use, and taxation factors as they relate to the mineral industry; and administers guidelines to new mine development. To carry out these tasks it is organized into four divisions; Titles, Inspection and Engineering, Geological, and Mineral Economics.

The divisions of the branch developed sequentially, as need dictated, starting with the appointment of the first Gold Commissioner in 1859 to administer placer title under the Provincial Secretary. The majority of recording offices are still not part of the Ministry as Government Agents act as Gold Commissioners and sub-recorders. A Chief Gold Commissioner was appointed as a Departmental official in 1937, and a central records office was created in Victoria in the same year followed thereafter by one in Vancouver. Claim inspectors were first appointed in 1974 and a Titles Division created.

A Provincial Mineralogist was appointed in 1895 in charge of a Bureau of Mines that was to record and assist the development of the mining industry. Initially, the Bureau consisted only of the Provincial Mineralogist and Provincial Assayer. Some additional staff was added leading to reorganization of the Bureau into six mineral survey districts with Resident Engineers appointed under the *Mineral Survey and Development Act* in 1917. The Bureau continued in this manner until 1934 when it was reorganized to become the Mineralogical Branch consisting of geological engineers based in Victoria. This evolved to the present Geological Branch in 1974 and at the same time district geologists' offices were once again established in addition to the geological survey offices in Victoria.

The first Inspector of Mines was appointed in 1877 at Nanaimo to supervise mine safety in the coal mines of Vancouver Island. An inspector of metalliferous mines was appointed, based in Nelson, in 1897. Two other inspectors were appointed soon after to inspect coal in the Crowsnest Coalfield and other metalliferous mines. A Chief Inspector was appointed in 1908 with augmented staff but the Branch was not created until 1929. It evolved with wider engineering and resource duties into the Inspection and Engineering Division of today.

The last element to be created was the Mineral Economics Division although its statistical duties had been performed first by the Bureau and then by the predecessor of Industry and Small Business Development. This was returned to the Ministry in 1974 as part of the Economics and Planning Division that acted for the whole Ministry. In 1976 this became the Mineral Economics Division with focus on mineral resources.

LEGISLATION

A moratorium was created by Order in Council 597 on March 13, 1980 prohibiting mining or exploring for uranium for seven years. The Bates Royal Commission of Inquiry, Health and Environmental Protection—Uranium Mining became partially circumscribed as a result but proceeded to publication in a three-volume work.

A new *Mines Act* was passed by the Legislature Fall sitting and received Royal Assent but proclamation was deferred pending complete revision of the Mines Regulations. The new Act combined the former *Mining Regulation Act* and the *Coal Mine Regulation Act* with regulations developed applying to all mining and also specifically to coal mining. The intent was to simplify the Act to general rules and provide regulation under Order in Council so that it can reflect the dynamics of technological development more adequately.

Amendments were made to the *Mineral Act* and to *Mining (Placer) Act* which gave the Lieutenant Governor in Council the following authority:

- to make conditional reserves
- to provide relief from all or part of the obligations required under the acts
- to permit the refund of monies under certain conditions.

The number of units or two-post claims that could be grouped under the *Mineral Act* was increased to 100 from 40. Funds were made available to cover refunds of cash-in-lieu paid on uranium claims. Complaints about staking or the recording of work under the *Mineral Act* must be made within one year of recording the claim or work, and are now made to the Chief Gold Commissioner who rules on the complaint. A fee must be paid when the complaint is made and appeal to the Chief Gold Commissioner's decision must be made to the courts.

Also during 1980 the *Mineral Resource Tax Act* was amended as follows:

- an outright exemption of $500 000 for individuals
- the inclusion of gross proceeds of recaptured exploration and development expenses
- restriction in the write-off of reclassified development expenses
- a revision of the processing allowance based on 8 per cent of original capital cost with differential maximum of 50 per cent and 70 per cent depending upon whether or not smelting and refining is performed
- an adjustment to the methods of payment.

BRANCH ACTIVITY

MINERAL RESOURCES BRANCH

The Mineral Resources Branch, under the direction of Assistant Deputy Minister, Edwin R. Macgregor, consists of four divisions: Inspection and Engineering, Geological, Titles, and Economics and Planning.

Inspection and Engineering Division

Coal mines, metal mines, and quarries were inspected during the year by inspectors stationed at the following listed locations. The inspectors also examined prospects, mining properties, roads and trails, and carried out special investigations under the *Mineral Act*. Dust, ventilation, and noise surveys were carried out by Environmental Control Inspectors under the supervision of S. Elias and, where necessary, recommendations were made regarding improvement to the environmental conditions. The roads and trails program was supervised by P. E. Olson. J. D. McDonald administered the reclamation sections of the *Coal Mine Regulation Act* and the *Mining Regulation Act*. Mine-rescue training was completed under the direction of the Coordinators, Mine-rescue Training, for the areas in which their stations were located.

Staff

Inspectors and Resident Engineers

W. C. Robinson, Chief Inspector of Mines	Victoria
V. E. Dawson, Deputy Chief Inspector of Mines (Coal and Special Services)	Victoria
A. J. Richardson, Deputy Chief Inspector of Mines (Metal)	Victoria
H. J. Dennis, Senior Inspector of Mines (Coal)	Victoria
T. G. Carter, Senior Mechanical-Electrical Inspector	Victoria
J. Cartwright, Electrical Inspector	Victoria
P. E. Olson, Road Engineer	Victoria
J. D. McDonald, Senior Reclamation Inspector	Victoria
D. M. Galbraith, Reclamation Inspector	Victoria
J. C. Errington, Reclamation Inspector (Agrologist)	Victoria
R. T. Martin, Geotechnical Inspector	Victoria
S. Elias, Senior Environmental Control Inspector	Vancouver
D. J. Murray, Environmental Control Inspector	Vancouver
S. J. L. Miller, Environmental Control Inspector	Vancouver
R. Kumar, Environmental Control Inspector	Vancouver
V. Pyplacz, Audiologist, Environmental Control	Vancouver
J. C. Ferguson Environmental Control Inspector-Technician	Vancouver
A. Parker, Environmental Control (Noise) Inspector-Technician	Vancouver
B. M. Dudas, Inspector of Mines and Resident Engineer	Vancouver
W. H. Childress, Inspector of Mines, Technician	Vancouver
J. W. Robinson, Inspector of Mines and Resident Engineer	Nanaimo
H. A. Armour, Inspector of Mines, Technician	Nanaimo
V. A. Pakalniskis, Inspector of Mines and Resident Engineer	Prince Rupert
B. Varkonyi, Inspector of Mines, Technician	Prince Rupert
S. J. Hunter, Inspector of Mines and Resident Engineer	Smithers
S. J. North, Inspector of Mines, Technician	Smithers
R. W. Lewis, Inspector of Mines and Resident Engineer	Prince George
T. Vaughan-Thomas, Inspector of Mines and Resident Engineer	Prince George
J. J. Sutherland, Inspector of Mines, Technician	Prince George
B. A. Gordon, Reclamation Inspector, Technician	Prince George

Inspectors and Resident Engineers—Continued

K. G. Hughes, Mechanical Inspector, Technician	Prince George
D. I. R. Henderscn, Inspector of Mines and Resident Engineer	Fernie
R. Bone, Inspector of Mines and Resident Engineer	Fernie
D. Smith, Inspector of Mines and Resident Engineer	Kamloops
E. S. Sadar, Inspector of Mines and Resident Engineer	Kamloops
J. P. MacCulloch, Inspector of Mines and Resident Engineer	Kamloops
J. A. Thomson, Inspector of Mines, Technician	Kamloops
R. H. Heistad, Reclamation Inspector, Technician	Kamloops
J. B. C. Lang, Inspector of Mines and Resident Engineer	Nelson
M. A. Mellor, Inspector of Mines, Technician	Nelson
A. L. O'Bryan, Reclamation Inspector, Technician	Nelson
E. J. Hall, Reclamation Inspector, Technician	Fort St. John

Coordinators, Mine-Rescue Training

G. J. Lee, Senior Coordinator	Victoria
R. F. Brow	Nanaimo
J. E. A. Lovestrom	Smithers
R. J. Stevenson	Prince George
B. A. McConachie	Kamloops
E. C. Ingham	Nelson
P. J. Switzer	Fernie

Staff Changes

In March, J. C. Ferguson resigned from the staff of the Environmental Control Section.

In April, S. J. L. Miller resigned from the staff of the Environmental Control Section.

In June, S. J. North resigned from the staff due to illness. He died in August.

R. T. Martin joined the Ministry as Geotechnical Inspector, on January 28, 1980.

V. A. Pakalniskis joined the Ministry as Inspector of Mines and Resident Engineer in the Prince Rupert office, on March 3, 1980.

B. A. Gordon joined the Ministry as Reclamation Inspector, Technician, in the Prince George office, on January 15, 1980.

R. Bone joined the Ministry as Inspector of Mines and Resident Engineer (Coal) in the Fernie office, on March 3, 1980.

A. Parker joined the Ministry as Environmental Control (Noise) Inspector, Technician, in the Vancouver office, on September 2, 1980.

R. W. Lewis joined the Ministry as Inspector of Mines and Resident Engineeer in the Prince George office, on August 5, 1980.

R. Kumar joined the Ministry as Environmental Control Inspector in the Vancouver office, on November 17, 1980.

M. A. Mellor joined the Ministry as Inspector of Mines, Technician, in the Nelson office, on October 23, 1980.

Mine Inspection and Safety

The *Mining Regulation Act* and the *Coal Mine Regulation Act* were enacted for the purpose of minimizing personal injury and property damage resulting from mining operations and to ensure maximum possible recovery of resources, having due regard to good engineering practices. The Inspection and Engineering Division has the responsibility of enforcing these Acts and ensuring that good practice is carried out by persons

engaged in mining in the province. The Division maintains a province-wide system of districts, staffed by experienced personnel, together with additional specialized personnel based in Victoria. A good standard of cooperation continued to exist at mines and safety programs were in effect at mines throughout the year.

Various certificates of competency, depending on a person's supervisory function, are required by certain supervisors and officials at mines. These are issued following examinations conducted by or on behalf of Boards of Examiners, appointed from the Inspection and Engineering Division, under the two Acts. The examinations are designed to ensure that the candidate has adequate knowledge of the Act and safe operating methods. In addition, miners' certificates, coal miners' certificates, and blasting certificates are issued by the District Inspectors.

Monitoring the dust, ventilation and noise conditions continued at most mining operations and in addition radiation surveys were made for radon daughters and gamma radiation at seven underground mines. In instances where environmental conditions were found to be unsatisfactory, management was requested to take remedial action. Audiometric testing of mine employees was continued at most mining operations.

Mine Rescue and First Aid

The promotion of mine rescue and first aid continued at a high level throughout 1980.

Six mine-rescue stations were fully maintained and under the supervision of coordinators who are fully qualified in all aspects of first aid and mine rescue. These districts are, as follows: Fernie, Nelson, Kamloops, Nanaimo, Prince George and Smithers. Each station is established as a mobile unit to transport equipment anywhere in these areas to be available for either rescue or training services, and is equipped with sufficient self-contained, oxygen-supplying, breathing equipment to maintain at least two rescue teams of six men each, should an emergency arise in the nearby mines. In addition to this equipment, some is on loan by the Ministry to supplement that owned by various mining companies.

In 1980, the mine-rescue equipment owned by this Ministry was 59 Aerorlox three-hour liquid oxygen breathing machines, 43 Draeger BG-174 and 30 Demand thirty-minute units. The equipment owned by industry was 30 Aerorlox and 45 Draeger BG-174. Each station, as well as most mines, has additional auxiliary equipment such as Type N gas masks, self-rescuers, gas detectors, oxygen therapy units and first-aid equipment.

The district coordinators of rescue training make periodic visits to the mines to give rescue training to open-pit and underground employees and to check the rescue equipment to ensure its serviceability.

Both full and refresher courses in underground, survival, gravel pit and surface mine-rescue training, as well as first aid, were presented by the district coordinators at various mines and centres throughout the province. The coordinators trained or assisted in the training of 313 persons obtaining St. John Ambulance first-aid certificates, 1 087 safety oriented first-aid certificates, 20 in Industrial First Aid, 206 in underground mine rescue work, 423 in surface mine rescue, 38 in gravel pit rescue, 384 in mine-rescue survival course, 17 received Surface Mine Rescue Instructors' certificates, 11 received Survival Mine Rescue Instructors' certificates, and 550 received talks on back problems.

Four mine-safety associations have been established in different areas in the province. These are supported by the Ministry of Energy, Mines and Petroleum Resources and are aided by mining company officials, safety supervisors, inspectors of

mines, mine-rescue coordinators and, in some areas, local industry. These organizations promote mine-rescue and first-aid training, as well as safety education in their various districts.

On May 24, 1980, the Vancouver Island Mine Safety Association held their 66th Annual Mine Rescue and First-Aid Competition in Nanaimo. In the Underground Mine Rescue event the Western Mines Limited team, captained by H. Uhrig, won the trophy. The Noranda Mines Limited Boss Mountain team, captained by G. Palm, placed second and represented the Central B.C. Mine Safety Association area at the Provincial Meet.

On June 7th the West Kootenay Mine Safety Association held their 34th Annual Competition in Nelson. The Cominco Sullivan mine team from Kimberley, captained by S. Hodgson, won the Underground Mine Rescue event.

On May 31st the East Kootenay Mine Safety Association held their 59th Mine Rescue and First-Aid Competition in Kimberley. In the Underground Mine Rescue event the Kaiser Resources Ltd. team from Fernie, captained by J. Peters, won the trophy.

On May 31, June 6 and June 7th the Central B.C. Mine Safety Association held their 32nd Annual Mine Rescue and First-Aid competition in Williams Lake, Smithers and Kamloops respectively. In the Surface Mine Rescue Central Zone event at Williams Lake, the mine rescue team, captained by J. Hawkins, placed first. The team from Granisle Mines, captained by B. Graffe, won the Northern Zone event trophy at Smithers on June 6th. The Southern Zone event on June 7th at Kamloops was won by the mine rescue team from Afton Mines, captained by F. Venzi.

On June 14th the Provincial Underground Mine Rescue, Surface Mine Rescue, Three-Person Miner First-Aid and Underground Bench Competitions were held in Nelson. In the Surface Mine Rescue event, the Lornex Mines team from Logan Lake, captained by J. Hawkins, placed first. In the Underground Mine Rescue event the Noranda Mines Ltd. Boss Mountain team from Hendrix Lake, captained by G. Palm, won the trophy. This team went on to compete in the Canadian Meet, held in Saskatoon, Saskatchewan on June 14, 1980. In the Underground Bench event, the Noranda Mines Ltd., Boss Mountain team from Hendrix Lake, captained by G. Palm, placed first. In the Three-Person Miner First-Aid event, the Similkameen Mines team from Princeton, captained by D. Mullin, won the trophy.

There were six provinces competing in the Canadian Meet held in Saskatoon, Saskatchewan on June 21st: British Columbia, Yukon, Northwest Territories, Alberta, Saskatchewan and Nova Scotia. The team from British Columbia placed first.

Safety of Mechanical/Electrical Equipment

The increase in mining activity of the last few years was maintained during 1980, consequently the number of items of mechanical and electrical equipment in use at the mines continued its upward trend. Surface vehicles, other than pick-up trucks but including haul trucks, loaders, shovels, drills and cranes, totalled around 3 000, showing a 16-per-cent increase over the previous year. The amount of equipment used at underground mines increased rapidly with a total of 113 permits being issued to allow the underground operation of diesel-powered equipment, an increase of some 66 per cent over the number issued the previous year.

The qualification of new model vehicles having a gross weight in excess of 50 000 kilograms continued as manufacturers brought out new models, or adapted versions of previously qualified models. Such vehicles were rigorously tested for braking and steering systems' performance once the detailed engineering drawings of these systems had been checked for compliance with the requirements of the Acts.

The increase in underground activity caused the commissioning of one production mine hoist during the year while development work, or engineering, was commenced for the addition of five more mine hoists.

The amount of electrical engineering and inspection work increased as the expansion of mining activity progressed and a great deal of time was spent reviewing design, manufacturing, and installation drawings for new or expanded mining facilities, in addition to inspection of the installed equipment.

Representation was continued on the committee responsible for updating Part V of the Canadian Electrical Code, pertaining to the Use of Electricity in Mines. In addition two members of the staff were invited to join separate technical committees charged with the task of producing Canadian Standards relating to diesel-powered equipment for underground coal mines, and fire-resistant fluids for use in underground mines.

Mining and Petroleum Roads

The Ministry of Energy, Mines and Petroleum Resources road program continued during 1980 under authority of the *Ministry of Energy, Mines and Petroleum Resources Act*.

The purpose of the program was to encourage and assist in the development of mineral and fossil fuel resources in the province.

During 1980 an expenditure of $2 057 000 was made to construct 43.5 kilometres of all-weather road to the Sierra-Yoyo gas-producing area east of Fort Nelson.

Approximately $399 000 was spent during the year to maintain and up-grade the Omineca Road, including the construction of two bridges, one across the Upper Lay Creek, and one across the Tenakihi Creek.

Approximately $147 000 was granted to nine smaller projects throughout the province by improving and constructing access roads to mineral-rich areas.

Reclamation Section

Reclamation is administered by the Inspection and Engineering Branch, under the authority of section 10 of the *Mining Regulation Act*, and section 9 of the *Coal Mine Regulation Act*. The objective is to restore lands used in mining, waste disposal, and exploration to useful purpose, compatible with the surrounding countryside. Reclamation does not apply to land disturbed by mining prior to legislation in April 1969.

Reclamation permits are issued on a permanent basis and annual reports are submitted and reviewed. Bonding requirements are assessed on a yearly basis from the annual reports. A total of 446 applications was received of which a total of 247 new reclamation permits (5 metal, 1 coal, 140 mineral exploration, 53 placer, 39 sand and gravel, 9 quarries) was issued during 1980.

Reclamation progressed satisfactorily during 1980 particularly in reclamation of disturbances from coal exploration and coal mining. The 46 active metal mines reported a total disturbance of 13 223 hectares, of which 1 594 hectares have now been revegetated. The four active coal operations reported a total disturbance of 5 150 hectares up to the end of 1980, of which 1 750 hectares have been reclaimed. During 1980 there was 165 hectares disturbed and 140 hectares reclaimed. In coal exploration to the end of 1980 there has been 2 075 hectares disturbed and 1 175 hectares reclaimed. During 1980 there was 150 hectares of disturbance and 110 hectares reclaimed. Total disturbance for coal exploration and mining to the end of 1980 is 7 225 hectares with 2 925 hectares being reclaimed, which is approximately 40 per cent of the total disturbance.

Vegetation studies are continuing at the operating mines and results are computerized and published for the benefit of the mining industry. Reclamation projects on abandoned tailings ponds are continuing with the Granby Tailings Pond at Princeton, showing good results in growing alfalfa.

The 4th Annual Mine Reclamation Symposium was held in March 1980, sponsored by the Ministry of Energy, Mines and Petroleum Resources and the Mining Association of British Columbia. One hundred and ninety participants attended the three-day session and heard talks on soils and fertilizers, waste dump management, establishment of vegetation and other resource and envionmental problems and solutions.

During the symposium the reclamation award for 1979 was presented to Fording Coal Ltd. for their development and application of conservation and reclamation technology designed to protect and rehabilitate land and watercourses within the Fording Valley. Citations were given to British Petroleum Exploration Canada, Ltd. at Sukunka, Utah Mines Limited—Island Copper Mine at Port Hardy and Kaiser Resources Ltd. at Sparwood. Honourable mention was given to Ranger Oil (Canada) Ltd., Silver Standard Mines Ltd., Newmont Mines Ltd. and Byron Creek Collieries Ltd.

Geological Division

Objectives and Organization

Metals, non-metallic minerals, and coal are non-renewable judged by the scale of man's lifetime. The province's needs for these commodities for our own use and for export are fulfilled only by continuous exploration and discovery. The fundamental role of the Geological Division is to facilitate the renewal process. To do this the detailed objectives of the Geological Division are to provide accurate and current information on the quantity and distribution of mineral and coal deposits of the province for government and industry, to provide geological, geochemical, and geophysical maps and other data, ideas, interpretations, and training useful in the search for these deposits, and to assist in the orderly exploration, development, and use of these resources. To carry out these objectives, the Division is organized into four sections: Project Geology, Applied Geology, Resource Data and Analysis, and Analytical Laboratory.

Staff

The staff on December 31, 1980, included 52 permanent positions and 10 full-time auxiliary positions. The permanent positions consisted of 28 geoscientists, 6 chemists, 10 technicians and technical assistants, and 8 secretaries, clerks, and office assistants. The auxiliary positions included two geoscientists, five technicians, and three office assistants. At the end of the year six permanent positions were vacant and three resignations were in hand.

A. Sutherland Brown, Ph.D., P. Eng. ..... Chief Geologist

Project Geology

W. J. McMillan, Ph.D., P. Eng. ..... Senior Geologist
B. N. Church, Ph.D., P. Eng. ..... Geologist
G. E. P. Eastwood, Ph.D., P. Eng. ..... Geologist
R. D. Gilchrist, B.Sc. ..... Geologist
T. Höy, Ph.D., P. Eng. ..... Geologist
D. G. MacIntyre, Ph.D., P. Eng. ..... Geologist
A. Panteleyev, Ph.D., P. Eng. ..... Geologist

D. E. Pearson, Ph.D., P. Eng.	Geologist
V. A. Preto, Ph.D., P. Eng.	Geologist
Vacant	Geologist
J. L. Armitage	Chief Draughtsman
R. E. Player	Lapidary and Photographer

Applied Geology

E. W. Grove, Ph.D., P. Eng.	Senior Geologist
Vacant	Deputy to Senior Geologist
G. G. Addie, M.Sc., P. Eng.	District Geologist
D. A. Grieve, M.Sc.	District Geologist
R. H. Karst, B.Sc.	District Geologist
G. H. Klein, B.A.Sc., P. Eng.	District Geologist
T. G. Schroeter, M.Sc., P. Eng.	District Geologist
G. P. E. White, B.Sc., P. Eng.	District Geologist
G. V. White, B.Sc.	Engineering Assistant

Resource Data and Analysis

J. G. McArthur, M.Sc.	Senior Geologist
Z. D. Hora, M.Sc.	Industrial Minerals Geologist
Vacant	Land Use Evaluation Geologist
Vacant	Resource Analyst Geologist
T. E. Kalnins, BSc., P. Eng.	Geologist
Vacant	Research Officer
J. E. Forester, M.A.	Research Officer
A. Matheson, B.Sc.	Research Officer

Analytical Laboratory

W. M. Johnson, Ph.D.	Chief Analyst
P. F. Ralph, L.R.I.C.	Deputy Chief Analyst
B. Bhagwanani, B.Sc.	Laboratory Scientist
R. J. Hibberson, B.Sc.	Laboratory Scientist
Y. T. J. Kwong, M.Sc.	Laboratory Scientist
V. V. B. Vilkos, Ph.D.	Laboratory Scientist
M. A. Chaudhry	Laboratory Technician
F. F. Karpick	Laboratory Technician
L. E. Sheppard	Laboratory Technician

Staff Changes

During 1980, the Division experienced a major staff turnover that seriously affected its capability to carry out its program. Dr. N. C. Carter, Senior Project Geologist, resigned to become Vice-President of Great Western Petroleum Corporation. Dr. E. W. Grove resigned during December 1980, effective in January 1981, to start his own consulting service. Mr. A. F. Shepherd, Deputy Director of Prospectors' Assistance, retired after 36 years of service with the Ministry. Dr. K. E. Northcote, Mineral Land Use Specialist, resigned to join the consulting and management firm, Bema Industries Ltd.; Dr. P. A. Christopher, uranium project geologist, resigned to work for Utah International Inc. Mr. G. L. James was transferred to Finance and Administration to become Coordinator for Data Processing. In addition, two other resignations were made at the end of the year to be effective early in 1981; Dr. D. E. Pearson to set up his own coal consulting firm, and Mr. R. H. Karst to become Chief Mine Geologist at Hinton, Alberta.

In contrast during the year, the only positions filled by competition were Dr. W. J. McMillan, who became Senior Project Geologist and Mr. J. G. McArthur, formerly with the Newfoundland Department of Mines and Energy, became Senior Geologist, Resource Data and Analysis.

The Work of the Division

The distribution of major projects in 1980 and of district offices, regional geochemical surveys, and map areas are shown on Figure 2.

Project Geology

The work of this section is devoted principally to geological mapping of areas important for mineral resources and to related research leading to better understanding of the origin and distribution of mineral deposits. It also conducts, with the help of the Analytical Laboratory, the regional geochemical reconnaissance surveys that are useful for both exploration and environmental baseline studies. The section, under N. C. Carter until June and later in the year W. J. McMillan, mounted 10 main field projects listed below. Field costs for the geological surveys were about $300 000 and a geochemical reconnaissance survey cost about $205 000. Salaries and other costs of the section totalled about $600 000.

The geological studies conducted principally by project geologists were augmented by similar work by district geologists and laboratory scientists. Cooperative studies included sampling of the Blizzard deposit by P. A. Christopher and J. Kwong for the latter to conduct detailed mineralogical work; mapping coal quality and correlation studies at both major coalfields and also a study of lead-zinc deposits in the southern Rocky Mountains by D. A. Grieve and T. Höy.

Major projects mounted by the section in 1980 included.

Project and Commodity	NTS Area	Map Publication Scale	Principal Investigators
(a) North Okanagan Tertiary stratigraphy and paleomagnetics (U, Au, Ag)	82E and parts of 82L	1:50 000	B. N. Church
(b) Southeast British Columbia lead and zinc resources, Moyie Lake and Revelstoke areas	82 G, L, M	1:50 000 and 1:10 000	T. Höy
(c) Barriere Lakes/Adams Plateau (Cu/Zn)	82M/3, 4, 5; 92P/1, 8	1:25 000	V. A. Preto
(d) Clearwater area (Cu, Zn, U)	82M/12W; 92P/8E, 9W	1:25 000	P. A. Schiarizza
(e) Sicker Group (Cu, Zn, Au, Ag)	92B/13	1:25 000	G. E. P. Eastwood
(f) Northeast British Columbia lead and zinc resources, Akie River area	94F/2, 3, 6, 11, 12, 13; 94L/1, 8	1:50 000	D. G. MacIntyre
(g) Cassiar area (Mo, W, Au)	104P/4, 5	1:25 000	A. Panteleyev and L. J. Diakow
(h) Crowsnest coalfield	82G/14, 15	1:10 000	D. A. Grieve and D. E. Pearson
(i) Peace River coalfield correlation studies	parts of 931, D	1:25 000	R. D. Gilchrist and P. McL., D. Duff
(j) Correlation of Lower Cretaceous stratigraphy from Peace River foothills to plains	93P; 94A	—	R. H. Karst

Project Geology Extension

The Regional Geochemical Survey in 1980 of Quesnel (93B) and Quesnel Lakes (93A) areas was done by a series of separate contracts with planning, supervision, and control provided by the Division. Considerable help in data handling was received from the Geological Survey of Canada.

Valuable additional work was also conducted by professors and graduate students at the University of British Columbia with the aid of grants from the Ministry. Many of these studies were directly relevant to Division projects and some were cooperative. The university studies included:

- Effect of Shear on Coal Quality by R. M. Bustin.
- Pacific Ocean Minerals Project by R. L. Chase, E. V. Grill, and J. W. Murray.
- A Preliminary Evaluation of Categorical Field Observations for Regional Stream Sediment Samples by P. Matysek, W. K. Fletcher, A. J. Sinclair, and A. Bentzen.
- Lead isotope-oriented Metallogenic Study of Mineral Deposits in B.C. by C. I. Godwin and A. J. Sinclair.
- Bowron Coalfield Study by G. E. Rouse and W. H. Mathews.
- MINDEP—Editing and Evaluation of Producer File by A. J. Sinclair.
- Isotopic Analysis by R. L. Armstrong.

At Western Ontario University the following project was sponsored:

- Gold Mineralization at Big Missouri Property by A. G. Galley and R. W. Hodder.

Progress in fieldwork of the Division and related university projects is described yearly in *Geological Fieldwork*, published early in the year following the work, and in a series of preliminary maps, papers and authoritative bulletins, issued irregularly.

Applied Geology

The work of the Applied Geology Section, under E. W. Grove, includes aid in the field to exploration personnel and prospectors, monitoring of exploration and geological developments at producing mines, coal core storage and studies, prospector training and control of incentive grants to exploration. District geologists conduct visits to mineral and coal properties and mapping as well as other duties related to prospectors, public information and integrated resource management. The geological studies are described in *Geological Fieldwork* and *Geology in British Columbia*.

A considerable part of the effort of the Section is devoted to prospectors and small developers. Over 550 students were enrolled in basic prospecting courses in 1980 and 32 prospectors graduated from the 2-week long Fourth Annual Mineral Exploration course held at David Thompson University Centre, Nelson. One hundred and fifty prospectors received grants under the *Mineral Prospectors Act*. The Mineral Exploration Incentive Program, started in 1978 with a yearly budget of $500 000, concluded in March 1980. It was designed to stimulate the industry by acting as a fiscal bridge between prospecting and preliminary development. The MEIP provided grants up to one-third of the receipted cost of approved programs to a maximum of $50 000. Forty-six contracts were let in 1979–80 under the supervision of J. Bristow. Payments totalling $290 077 were responsible for initiating $3 655 298 worth of mineral exploration, including more than $700 000 in diamond drilling. Ongoing projects funded in 1979–80 include Banwan Gold Mines Ltd.; Consolidated Cinola Mines Ltd.; Dimac Resource Corp.; Granges Exploration Aktiebolag (Capoose Lake); Hallmac Mines Ltd. (Sandon); Penresh Exploration; and Scottie Gold Mines Ltd.

The approximate operating costs of Applied Geology programs other than the MEIP were as follows: core repository and recovery, $80 000; prospector training, $40 000; Prospectors' Assistance grants, $240 000; field programs of district geologists, $100 000; permanent salaries, $320 000.

Resource Data and Analysis

This section, under J. G. McArthur, is responsible for the collection, compilation, interpretation, distribution, and approval of exploration and development data gathered from various sources. Most of the information is made generally available after requisite confidential periods, normally 1 to 3 years.

The major files are:

Mineral Assessment Reports—over 7 000 microfilmed reports available at reader/printers in Vancouver and Victoria.

Mineral Assessment Report Index—a computerized bibliographic index updated annually.

MINFILE—a shallow level computerized information system with data on over 8 000 mineral occurrences. Statistical data on mineral production and reserves.

Property Files—open files containing published and unpublished reports and maps (historical) on producers and prospects and filed by NTS.

Coal Assessment Reports—nearly 500 reports on coal exploration. Non-confidential reports are available in Victoria.

Coal Data File—a computerized coal data is being constructed.

The annual volume, *Exploration in British Columbia*, is produced by the section coincident with its update of MINFILE.

In addition, the section administers the Portable Assessment Credit account, produces map compilations and mineral potential evaluation studies related to land-use conflicts, and advises on regulations. Field-oriented studies related to industrial minerals and structural materials are also handled by this section.

A major field study of aggregate materials of the lower mainland and Vancouver Island was completed under the direction of Z. D. Hora with the cooperation of the Mineral Economics Division.

Specific site investigations in regard to land-use assessments were carried out largely by district geologists.

The budget of this section was approximately as follows: non-metallic field studies, $26 500; MINFILE and land use, $42 000; coal file construction, $72 000; permanent salaries, $340 000.

Analytical Laboratory

The Laboratory, under W. M. Johnson, is responsible for a complete range of analytical services for the Division geologists and prospector grantees as well as some services to other government agencies. The laboratory also runs control samples and handles the chemical data for the British Columbia regional geochemical surveys. The Chief Analyst is also responsible for assayer examinations for the province, and assists in the organization, administration, and control of the regional geochemical reconnaissance.

The facilities include X-ray fluorescence, atomic absorption and emission spectrography, X-ray diffraction, gamma-ray spectrometry, and mineral separation. Capability in traditional fire assay and wet analytical chemistry still exists.

Method development and research in the laboratory concentrated in 1980 on the following subjects: mineralogy of the Afton orebody, coal oxidation and liquefaction, measurement of low levels of gold in silts, monitoring of uranium in natural waters, trace elements in molybdenum concentrates, geochemical standards, and new methods of determination of gold in copper concentrates. Many of these studies cooperated with Project Geology or with other agencies. These studies were as follows:

The distribution of the minerals in the Afton orebody by J. Kwong as his thesis work for his Ph.D. from the University of British Columbia.

Investigation of the oxidation of coals and coal liquefaction by Dr. Paul West of the University of Victoria with W. M. Johnson and D. E. Pearson. There is also close liaison with B.C. Research in their coal liquefaction work.

Development and coordination by W. M. Johnson of a domestic water monitoring program with the Ministry of Health.

Development of a new method of determining gold in both exploration samples and copper concentrates by M. A. Chaudhry.

Development of trace elements analysis by X-ray fluorescence by P. F. Ralph and V. V. B. Vilkos.

Participation in interlaboratory standards program, particularly by P. F. Ralph, M. A. Chaudhry, and B. Bhagwanani in determination of seventeen major and trace elements in two standard reference materials put out by the National Research Council and also the determination of uranium and thorium in the CANMET standard DL-2.

Establishment of reference geochemical silt materials containing cobalt, nickel, silver, uranium, tungsten, and tin in cooperation with the Geological Survey of Canada.

Cooperative program between W. M. Johnson and Dr. Ian Jonasson of the Geological Survey of Canada in regard to rhenium, lanthanum, and gold in molybdenum concentrates from Canadian mines.

Certification

Two Certification of Efficiency in Assaying examinations were held with a total of 12 examinees writing. Ten Certificates of Efficiency were awarded.

Output

Wet Chemical and X-ray Fluorescence Laboratory: there were 2 033 determinations on 912 samples submitted by prospectors and prospector grantees, and 8 270 determinations on 1 119 samples submitted by Ministry personnel.

Emission Spectrographic Laboratory: there were 46 950 semi-quantitative determinations on 1 565 samples. In addition, there were 1 407 quantitative results on 219 samples.

X-ray Diffraction Laboratory: there were 515 mineral identifications made, determination of mineral matter in ash of coals on 40 samples, and 16 determinations on quartz and 311 semi-quantitative results obtained.

Sample Comminution: there was a total of 2 754 samples received and prepared for analytical work, 1 842 from geologists and 912 from prospector grantees and general prospectors.

Mineral Separation: there were 14 mineral separations done.

Budget

The Laboratory's budget was $274 000 for salaries, $51 000 for supplies and equipment, and $13 000 for travel and miscellaneous.

Professional Activities

The staff of the Division was active in professional activities related to their work during 1980 including organizing and attending meetings, visits, and executive activities in societies.

Two meetings and a major field excursion were organized by the Division during the year:

(1) A Review of Activities of the Division for the exploration industry and other interested public took place at the Newcombe Auditorium of the Provincial

Museum in February. This is expected to be a biennial event. All geoscientists gave talks on their work and most displayed maps of recent projects. A tour of the laboratory was an integral part of the day.

(2) A 3-day colloquium on the geology of the Peace River coalfield was organized by R. D. Gilchrist and took place in Qualicum Beach in February. Forty-five geologists working on Peace River coal geology from industry, government, and university participated in the workshop.

(3) A field excursion to porphyry copper deposits of the southern Intermontane Belt was led by W. J. McMillan and V. A. Preto. The trip, sponsored by the Minerals Deposit Division of the Geological Association of Canada, visited Afton, the Highland Valley mines, and Ingerbelle. Forty-six geologists attended.

The staff were involved in much foreign travel for educational, scientific, and trade mission purposes, some at their own expense.

D. G. MacIntyre and T. Höy visited classic shale-hosted lead-zinc deposits in Germany as an aid to their studies of similar deposits in British Columbia.

D. E. Pearson visited SASOL I and II plants in South Africa and similar facilities in West Germany in regard to coal liquefaction and quality of feedstocks.

W. J. McMillan and A. Sutherland Brown attended the International Geological Congress in Paris, both gave talks and chaired sessions. McMillan's was the culmination of a joint study with the BRGM of France. Sutherland Brown was a delegate for Canada to the IGC and the International Union of Geological Sciences general meetings.

N. C. Carter was part of a British Columbia trade mission on base metals that visited Japan and Korea.

Executive activities by staff included:

Canadian Institute of Mining and Metallurgy—D. E. Pearson was elected councillor of the Institute and A. Panteleyev was Victoria Branch Chairman.

Geological Association of Canada—A. Sutherland Brown was Past President of the Association. A. Panteleyev was a councillor of the Cordilleran Section and W. J. McMillan was secretary of the local Section.

W. M. Johnson was Past President of the Spectroscopy Society of Canada and Chairman of the Analytical Chemistry Division of the Chemical Institute of Canada.

N. C. Carter was a councillor of the British Columbia Association of Professional Engineers.

A. Sutherland Brown also served on the Advisory Committee to the Geological Survey of Canada, the Committee of Provincial Geologists, and the Canadian Geoscience Council.

In addition a large number of talks were given on their work by staff at a variety of scientific and exploration meetings, the subjects of which will be published later.

Publications

The work of the Division is presented to the interested public by a series of formal publications and maps as well as by technical talks, consultations, and informal discussions.

Formal publications prepared by the Division in 1980 include the following:

Prepared yearly:

Geological Fieldwork—a preliminary account of work of the Division as soon as possible after completion. Now published as part of the paper series of the Ministry.

Exploration in British Columbia—a report that summarizes and collates all known exploration in the Province based on reports filled out jointly by the Division and industry personnel.

At irregular intervals:

Bulletins—these are generally the result of 3 or 4 years' work and commonly of areas of significant mineral potential. In 1980 one was published:

Bulletin 73—*Geology of the Riondel Area, Central Kootenay Arc*, by Trygve Höy.

Preliminary Maps—usually white prints issued as soon as compilations are complete with brief accompanying notes. In 1980 the following five were issued:

36—*Geology of the Estella-Kootenay King Area, Hughes Range*, by Trygve Höy. Parts of 82G/11, 12, 13, 14. (scale 1:50 000.)

37—*Geology of the Terrace Mountain Tertiary Outlier*, by B. N. Church. Parts of 82L/4E, 5E. (scale 1:50 000.)

38—*Geological Compilation and Mineral Occurrence Map, Driftpile Creek-Akie River Ba-Pb-Zn Mineral District*, by D. G. MacIntyre. Parts of 92F and 94K. (scale 1:250 000.)

39—*Geology of Kelowna Tertiary Outlier (West Half)*, by B. N. Church. Part of 82E/13. (scale 1:50 000.)

40—*Geology of Mt. Richards Area, Vancouver Island*, by G. E. P. Eastwood. Part of 92B. (scale 1:15 840.)

Other maps and data issued included:

Regional Geochemical Surveys 5 and 6

BC RGS-5, NTS 92O—Taseko Lakes

BC RGS-6, NTS 92P—Bonaparte River

Scale 1:250 000—13 elements in silts, 2 + pH in water

No aeromagnetic maps were issued in 1980.

No new nor revised Mineral Deposit/Land Use maps were issued in 1980.

Regularly updated maps in the following series are available:

Mineral Inventory Maps—issued as ozalid prints, show location and commodities of all known mineral deposits.

Assessment Report Index Maps—show the location and number of reports accepted for assessment credit by the Ministry. A new Assessment Report Index to accompany the map series was issued in a ring binder for regular update.

Works published in external refereed and technical journals in 1980 included the following:

Church, B. N. and Johnson, W. M., Calculation of the Refractive Index of Silicate Glasses from Chemical Composition; *Geol. Soc. Am.*, Bull., Part I, pp. 619–625.

Creaney, S., Pearson, D. E., and Marconi, L. G., Anomalous Coking Properties of the Wolgan Seam, NSW, Australia; *Fuel*, Vol. 59, No. 6, June 1980.

Johan, Z., Le Bel, L., and McMillan, W. J., Mineralization Lieés aux Granitoides, *Bureau de Recherches Geologigues et Minieres*, Memoir No. 99, Chap. 3 and 4, pp. 21–94.

McMechan, M., Höy, T. and Price, R. A., *Can. Petrol. Geol.*, Bull., Vol. 28, No. 4, pp 542–558.

McMillan, W. J. and Panteleyev, A., Ore Deposit Models—1 Porphyry Copper Deposits, *Geoscience Canada*, Vol. 7, No. 2, pp. 52–63.

Painter, P. C., Snyder, R. W., Pearson, D. E., and Kwong, J., Fourier Transform Infrared Study of the Variation in the Oxidation of a Coking Coal, *Fuel*, Vol. 59, No. 5, May 1980, pp. 282–286.

Pearson, D. E., The Quality of Western Canadian Coking Coal, *CIM*, Bull., Vol. 73, No. 813, pp. 70–84, January 1980.

Pearson, D. E. and Creaney, S., Spontaneous Carbonization of Oxidized High-volatile Coal by a Lightning Strike, *CJES, 1980*, Vol. 17, pp. 36–42, January 1980.

Sutherland Brown, A. and Matheson, A., The Next Decade: Major Mineral Resource Expansion in B.C., *Western Miner*, Vol. 53, pp. 48–54, No. 2, February 1980.

Sutherland Brown, A., Metallogeny by Numbers, *Geoscience Canada*, Vol. 7, No. 3, pp. 95–102.

Titles Division

The Titles Division of the Mineral Resources Branch is under the direction of the Chief Gold Commissioner and is responsible for the administration of the provincial laws relating to the acquisition of minerals and coal.

Staff

R. Rutherford ..... Chief Gold Commissioner
Vacant ..... Deputy Chief Gold Commissioner
D. Doyle ..... Gold Commissioner, Vancouver

Gold Commissioners and Sub-recorders are appointed for the 24 Mining Divisions throughout the province and their duties are specified in writing by the Chief Gold Commissioner.

Table 2-1—Gold Commissioners and Claims Inspectors

Mining Division	Phone	Location of Office	Name
Alberni	723-3501	4515 Elizabeth St., Port Alberni V9Y 6L5	W. G. Mundell
Atlin	651-7577	Box 100, Atlin V0W 1A0	E. J. Johnstone
Cariboo	992-5591	102, 350 Barlow Avenue, Quesnel V2J 2C1	R. Campbell
Clinton	459-2268/69	Box 70, Clinton V0K 1K0	J. R. Frey
Fort Steele	489-3521	102—11th Avenue South, Cranbrook V1C 2P2	W. R. Anderson
Golden	344-5221/22	Box 39, Golden V0A 1H0	J. Olson
Greenwood	442-8642	Box 850, Grand Forks V0H 1H0	S. Matsuo
Kamloops	372-5233	Courthouse, Kamloops V2C 1E5	C. Kirk
Liard	387-1385	411 Douglas Building, Parliament Buildings, Victoria V8V 1X4	E. A. H. Mitchell
Lillooet	256-7548	Box 70, Lillooet V0K 1V0	R. E. Hall
Nanaimo	754-2111	Courthouse, Nanaimo V9R 5J1	I. Williams
Nelson	352-2211	310 Ward Street, Nelson V1L 5S4	H. S. Tatchell
New Westminster	525-0375	100, 403 Sixth Street, New Westminster V3L 3B1	T. P. McKinnon
Nicola	378-6141	Box 339, Merritt V0K 2B0	L. P. Lean
Omineca	847-4411	Box 340, Smithers V0J 2N0	A. W. Milton
Osoyoos	493-1719	Courthouse, Penticton V2A 5A5	L. D. Sands
Revelstoke	837-3222	Box 380, Revelstoke V0E 2S0	D. G. B. Roberts
Similkameen	295-6957	Box 9, Princeton V0X 1W0	W. L. Marshall
Skeena	624-2121	Courthouse, Prince Rupert V8J 1B7	Vacant
Slocan	353-2219	Box 580, Kaslo V0G 1M0	Mrs. J. James
Trail Creek	362-7324	Box 910, Rossland V0G 1Y0	A. D. Sherwood
Vancouver	668-2672	800 Hornby Street, Vancouver V6Z 2C5	D. Doyle
Vernon	545-2387	Courthouse, Vernon V1T 4W5	N. A. Nelson
Victoria	387-1385	411 Douglas Building, Parliament Buildings, Victoria V8V 1X4	E. A. H. Mitchell

Claims Inspectors

D. Lieutard, 401, 350 Barlow Avenue, Quesnel V2J 2C1
T. Jones, Box 877, Smithers V0J 2N0
R. Conte, 800 Hornby Street, Vancouver V6Z 2C5
H. S. Turner, 212, 2985 Airport Drive, Kamloops V2B 7W8

The recording of locations and of work on mineral claims as required pursuant to the provisions of the *Mineral Act*, and the recording of work on placer leases as required under the *Mining (Placer) Act*, must be made at the office of the Gold Commissioner for the Mining Division in which the claim or lease is located. The statistics for the Gold Commissioner's office are shown on Table 2-2.

Central Records Office (Victoria and Vancouver)

Copies of records of mineral claims and 2 post claims recorded in the office of Gold Commissioners are forwarded to the office of the Chief Gold Commissioner daily, while transcripts of all other recording in the offices of the Gold Commissioners are sent twice monthly.

Information concerning claims and leases and the ownership and standing of claims and leases in any Mining Division may be obtained from the Gold Commissioner for the Mining Division in which the property is situated or from the Ministry's offices, Room 411, Douglas Building, Victoria, and 800 Hornby Street, Vancouver, the office of the Gold Commissioner.

Table 2-2—Gold Commissioners' and Mining Recorders' Office Statistics, 1980

Mining Division	Free Miners' Certificate		Lode Mining						Placer Mining					Revenue		
	Individual	Company	Mineral Claims Units	Work Numbers	Cash in Lieu	Bills of Sale, Etc.	Mining Leases Issued	Lease Rentals	Lease Issued	Work Numbers	Cash in Lieu	Bills of Sale, Etc.	Extensions	Free Miners' Certificates	Mining Receipts	Total
					$			$			$			$	$	$
Alberni	150	4	2252	2352	25,630	55	....	2,694	1	....	.....	....	....	2,050	62,184.50	64,234.50
Atlin	540	6	3072	9246	85,800	54	....	164	77	370	12,000	60	43	4,600	221,237.75	225,837.75
Cariboo	3287	20	4542	3480	40,590	80	....	11,448	363	1035	19,450	187	55	22,445	202,352.75	224,797.75
Clinton	153	1	3736	3135	24,090	45	....	104	9	108	4,200	28	....	1,065	73,143.32	74,208.32
Fort Steele	588	8	2390	7916	33,000	18	....	2,768	20	61	3,150	8	1	5,340	147,653.00	152,993.00
Golden	228	8	2746	2329	29,260	31	....	1,028	2	6	600	....	1	3,750	67,506.08	71,256.08
Greenwood	195	3	1630	3137	46,530	80	....	4,520	6	13	50	6	2	1,875	107,564.50	109,439.50
Kamloops	884	20	5524	17252	87,120	113	4	23,228	1	39	300	8	1	10,520	250,130.75	260,650.75
Liard	737	2	6992	17421	79,970	72	....	3,024	109	204	14,400	75	5	4,285	303,116.50	307,401.50
Lillooet	184	1	4862	2852	25,850	82	....	2,240	6	66	300	6	5	1,220	86,712.80	87,932.80
Nanaimo	538	7	961	3182	36,520	32	....	8,110	....	3	.....	....	....	4,790	67,620.60	72,410.60
Nelson	568	4	1812	3791	24,640	71	....	952	6	14	.....	3	....	4,040	69,189.00	73,229.00
New Westminster	1405	34	2730	6007	45,100	68	....	1,920	2	97	300	11	3	17,325	89,109.00	106,434.00
Nicola	140	2	1338	3167	15,950	65	....	1,850	....	....	.....	....	....	1,300	51,639.90	52,939.90
Omineca	655	12	9553	19171	88,800	137	1	21,748	47	129	2,220	6	17	6,875	332,502.81	339,377.81
Osoyoos	332	6	2208	4414	55,330	46	....	7,870	....	....	.....	....	....	3,460	88,644.50	92,104.50
Revelstoke	214	7	2236	3098	49,500	57	....	502	19	35	.....	4	3	3,170	91,066.50	94,236.50
Similkameen	322	3	2123	3975	40,260	50	....	4,476	79	165	1,250	34	5	2,610	56,712.00	59,322.00
Skeena	478	2	5315	8634	97,020	120	....	3,922	9	6	.....	....	....	3,020	252,695.42	255,715.42
Slocan	268	10	3087	6155	33,660	128	....	6,022	....	3	.....	....	....	4,340	79,869.84	84,209.84
Trail Creek	113	3	268	707	2,640	23	....	854	....	....	.....	....	....	1,465	10,672.00	12,137.00
Vancouver	4882	708	1201	5769	11,330	35	....	1,192	....	....	.....	....	....	234,840	96,735.35	331,575.35
Vernon	855	9	927	3040	15,070	29	....	654	5	34	.....	2	....	6,975	52,253.50	59,228.50
Victoria	1124	114	844	912	7,590	16	....	80	7	32	1,200	5	2	39,775	241,187.56	280,962.56
Total 1980	18840	994	72349	141142	1,001,330	1507	5	111,370	763	2420	113,000	443	143	391,145	2,955,323.46	3,492,634.93
Total 1979	14591	643	55252	76233	651,860	944	3	94,176	970	1305	23,100	210	30	289,263	1,696,246.13	1,985,509.13

The Records and maps, showing the approximate positions of mineral claims held by record and of placer leases, may be viewed by the public during regular office hours in Victoria, and at the office of the Gold Commissioner in Vancouver. The position of mineral claims held by record and of placer leases is plotted from details supplied by the locators. Prints of mineral and placer titles reference maps at a scale of 1:50 000 may be obtained from the Victoria and Vancouver offices.

Appointed officials in the office of the Gold Commissioner at Victoria and the Gold Commissioner at Vancouver act as Sub-recorders for all Mining Divisions.

Mineral and Placer Title Maps

The initial program of redrawing mineral titles reference maps which are produced for the public on a scale of 1:50 000 was completed in 1977 and the entire province is now available at this scale.

Three thousand and seven applications were received for placer leases under a new system, established in 1975 with the proclamation of a new *Mining (Placer) Act*, of only accepting applications for leases in designated placer areas.

There were 52 requests for the designation of additional areas under the *Mining (Placer) Act*.

Mineral Claims Inspectors are based at Kamloops, Smithers, Vancouver and Quesnel. Their duties include checking the locations of mineral claims to correlate them with the plotted position of the claims, determining the validity of the staking under the *Mineral Act* and the *Mining (Placer) Act* and Regulations, investigations of possible misuse of mineral claims, and investigations of disputes. In order to fulfill the objectives of providing claim-holders with firm titles and maintaining accurate and up-to-date records, the activities of the inspectors have increased with the use of the modified grid system and also as a result of the increase in applications for placer leases.

During 1980 as a result of 22 complaints under section 50 (formerly section 80) of the *Mineral Act*, 28 mineral claims were cancelled.

The Gold Commissioner's office in Vancouver is now equipped with a microfilm reader which will allow the general public to view technical reports. The Xerox machine will print these reports at a nominal cost. The Vancouver office should now become a greater source of information for the mining community.

Coal

The Coal Administrator is responsible to the Chief Gold Commissioner for the daily administration of the *Coal Act*. This involves reviewing applications for coal licences and leases and maintenance of records of title.

The statistics related to coal licences for 1980 are shown in Table 2-3.

Table 2-3—Statistics for Coal Licences, 1980

Number of coal licence applications	904
Approximate areas of coal licence applications	243 035 hectares
Number of coal licences issued	1 120
Approximate area of coal licences issued	304 171
Annual rental	$4 642 000.00
Application fees	$ 9 040.00
Cash in lieu of work	$ 92 000.00
Miscellaneous fees	$ 5 960.00

Mineral Economics Division

Objectives and Organization

The Branch provides economic, financial, and statistical analyses pertaining to provincial mineral sector policy, legislation, and planning, and also collects, maintains, and disseminates comprehensive statistical data in support of Ministry resource management responsibilities. These major objectives are further delineated as follows:

(1) the provision of expertise on the economic aspects of mineral sector policy and planning including assistance on the formulation of incentive programs, infrastructure support programs, taxation and tenure systems, appropriate evaluation frameworks, and provincial and intergovernmental mineral policies;
(2) the conduct of selected mineral industry economic analyses including marketing, supply, financial, economic and fiscal evaluations of mineral projects and government programs, and environmental-economic and socio-economic assessments; and
(3) the collection, maintenance, and dissemination of comprehensive British Columbia mineral industry statistics for use by the Branch, the Ministry, and other users, covering producing metal, coal, industrial minerals, structural materials, and placer operations, and associated production, sales, and values of commodities produced from these operations.

Formerly known as the Economics and Planning Division, the Mineral Economics Branch is currently organized under the Director into three groups--an administrative support group, an economic and financial analysis group, and a mineral statistics group. The Branch will be expanded next year to include a fourth group: mineral policy analysis.

Staff

The permanent staff of the Branch, as of December 31st 1980, was as follows:

Director	F. C. Basham
Economic and Financial Analysis—	
Senior Economic Analyst	J. F. Clancy
Senior Financial Analyst	P. Monier
Mineral Statistics—	
Senior Mining Statistician	W. Wilson
Clerk V	K. Dornan
Clerk V	Barbara MacDonald
Administrative Support—	
Office Manager	Josephine Harris
Office Assistant	Signy Thorleifson

During the year the permanent staff remained unchanged. Three students from the University of Victoria joined the group for several months each. With supervision from John Clancy, Dan Sollis worked on a study of world copper markets. Sheila Drew, with supervision from Philippe Monier, contributed to the ongoing refinements to CØALMØD, the Ministry's financial simulation model for coal mines. Klaus Brueckl participated in the development of MINSTATS, a computerized data bank for storing mineral statistics.

Review of Activities

Major activity areas for the Branch during the year included the evaluation of emerging coal and metal projects under the Guidelines for Coal Development and Procedures for Approval of Metal Mine Development pursuant to infrastructure assistance and benefit cost analysis of prospective coal and metal projects in several regions.

Concurrent with these evaluations, efforts were also directed toward refining and updating CØALMØD and MINSIM, the Ministry's computerized financial and economic evaluation systems for coal and metal mining projects respectively.

The paper entitled 'CØALMØD, A Financial and Policy Simulation Model for Coal Mining Developments' by Frank Basham and Philippe Monier was published in the Canadian Institute of Mining and Metallurgy Bulletin. The paper was presented by the authors at the 1980 APL Users Meeting in Toronto.

A major study of the molybdenum mining industry in a world context, undertaken in 1979 by John Clancy and summer student John Tyhurst, was also completed in 1980. First drafts of studies in the following areas were prepared: the outlook for barite production in B.C., copper markets, and sand and gravel production in the lower mainland.

During the spring, Frank Basham participated in the B.C. Technical Mission to Japan and Korea. Other members of the team were E. R. Macgregor and N. C. Carter of this Ministry, and G. B. McRae from the Ministry of Industry and Small Business Development. The team prepared two overview reports on each of Japan and Korea. Subsequently the Division became involved in a host of follow-up visits from Japanese and Korean companies interested in British Columbia as a location for further processing, or for the procurement of concentrates.

The Copper Smelting and Refining Technologies Seminar, arranged by this Division, was held November 5th and 6th in Vancouver. With speakers from six major international companies, and a registration which included representatives of industry and government from all over the world, the seminar was an unqualified success.

Staff of the Division continued to provide information on mineral policy and project planning to domestic and foreign groups of investors, buyers and other parties. Discussions ranged from general policy matters, to coal market potential, and mineral processing and fabricating opportunities in British Columbia.

The mineral statistics group's activity during the year included assembly and dissemination, on a monthly and annual basis, the survey, collection, editing, and compilation of all mineral production activity and data for the province. Staff in the group participate regularly in joint consultative efforts with other governments to streamline the data collection process and improve the accuracy and validity of mineral statistical reports. The Division also continued with planning and programming for computerization of the monthly metal mine surveys, through the MINSTATS project. This work is expected to be completed in 1981 and will result in a much improved and more timely statistical reporting system.

Mineral Resource Statistics

CHAPTER 3

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INTRODUCTION

The statistics of the mineral industry are collected, compiled, and tabulated for this Report by the Mineral Economics Division of the Mineral Resources Branch.

In the interests of uniformity and to avoid duplication of effort, beginning with the statistics for 1925, Statistics Canada and the provincial ministries have cooperated in collecting and processing mineral statistics.

Producers of metals, industrial minerals, structural materials, coal, and petroleum and natural gas are requested to submit returns in duplicate on forms prepared for use by the province and by Statistics Canada.

As far as possible, both organizations follow the same practice in processing the data. The final compilation by Statistics Canada is usually published considerably later than the *Annual Report of the Ministry of Energy, Mines and Petroleum Resources* for British Columbia. Differences between the values of production published by the two organizations arise mainly because Statistics Canada uses average prices considered applicable to the total Canadian production, whereas the British Columbia mining statistician uses prices considered applicable to British Columbia production.

Peat, classified as a fuel by Statistics Canada, is not included in the British Columbia statistics of mineral production, being regarded as neither a fuel nor a mineral.

The statistics of the petroleum industry are collected, compiled, and tabulated for this Report by the Petroleum Resources Branch.

METHODS OF COMPUTING PRODUCTION

The tabulated statistics are arranged so as to facilitate comparison of the production records for the various mining divisions, and from year to year. From time to time, revisions have been made to figures published in earlier reports as additional data became available or errors became known.

Data are obtained from the certified returns made by the producers of metals, industrial minerals and structural materials, and coal, and are augmented by data obtained from custom smelters. For petroleum, natural gas, and liquid by-products production figures supplied by the Petroleum Resources Branch of the Ministry of Energy, Mines and Petroleum Resources are compiled from the monthly disposition reports and the Crown royalty statement filed with the Ministry by the producers.

Values are in Canadian funds. Metric weights are used throughout.

METALS

Average Prices

The prices used in the valuation of current and past production of gold, silver, copper, lead, and zinc are shown in the table on page 71.

Prior to 1974 the price of gold used was the average Canadian Mint buying-price for fine gold.

The price used for placer gold originally was established arbitrarily at $17 per ounce, when the price of fine gold was $20.67 per ounce. Between 1931 and 1962 the price was proportionately increased with the continuously changing price of fine gold. Since 1962, Canadian Mint reports giving the fine-gold content have been available for all but a very small part of the placer gold produced, and until 1973 the average price listed is derived by dividing ounces of placer gold into total amount received. Starting in 1974 the price used for the valuation of gold, lode and placer, is the amount received by the producer.

Prior to 1949 the prices used for silver, copper, lead and zinc were the average prices at the markets indicated in the table on page 71, converted into Canadian funds. The abbreviations in the table are Mont. = Montreal; N.Y. = New York; Lon. = London; E. St. L. = East St. Louis; and U.S. = United States.

Starting in 1949 the price of silver, copper, lead, and zinc were average United States prices converted into Canadian funds. Average monthly prices were supplied by Statistics Canada from figures published in the Metal Markets section of *Metals Week*. Specifically, for silver it was the New York price; for lead it was the New York price; for zinc it was the price at East St. Louis of Prime Western; for copper it was the United States export refinery price. Commencing in 1970 the copper price is the average of prices received by the various British Columbia shippers and since 1974 this applies also to gold, silver, lead, zinc, and cadmium.

For antimony and bismuth the average producers' price to consumers is used. For nickel the price used is the Canadian price set by Inco Limited. The value per tonne of the iron ore used in making pig iron at Kimberley was an arbitrary figure, being the average of several ores of comparable grade at their points of export from British Columbia.

Gross and Net Content

The gross content of a metal in ore, concentrate, or bullion is the amount of the metal calculated from an assay of the material, and the gross metal contents are the sum of individual metal assay contents. The net contents are the gross contents less smelter and refinery losses.

In past years there have been different methods used in calculating net contents, particularly in the case of one metal contained in the concentrate of another. The method established in 1963 is outlined in the following table. For example, the net content of silver in copper concentrates is 98 per cent of the gross content, of cadmium in zinc concentrates is 70 per cent of the gross content, etc. Commencing in 1974 the quantities represent the actual net quantities of metals paid for.

	Lead Concentrates	Zinc Concentrates	Copper Concentrates	Copper-Nickel Concentrates	Copper Matte
	Per Cent	Per Cent	Per Cent	Per Cent	Per Cent
Silver	98	98	98	...	98
Copper	*Less* 26 lb./ton	...	*Less* 10 lb./ton	85	*Less* 10 lb./ton
Lead	98	50	...	...	50
Zinc	50	90	...	...	...
Cadmium	...	70	...	...	...
Nickel	...	...	...	88	...

Value of Production

For indium, iron concentrate, mercury, molybdenum, rhenium, and tin the value of production is the amount received by the shippers.

For gold, silver, copper, lead, zinc, antimony, bismuth, cadmium, some iron concentrate, and nickel the value of production was calculated from the assay content of the ore, concentrate, or bullion less appropriate smelter losses, and an average price per unit of weight. Since 1974 the values represent the settlement values received by the producers for the respective metals.

Prior to 1925 the value of gold and copper produced was calculated by using their true average prices and, in addition, for copper the smelter loss was taken into account.

The value of other metals was calculated from the gross metal content of ores or concentrates by using a metal price which was an arbitrary percentage of the average price, as follows: silver, 95 per cent; lead, 90 per cent; and zinc, 85 per cent.

It is these percentages of the average price that are listed in the table on page 71.

For 1925 to 1973 the values had been calculated by using the true average price (*see* page 71) and the net metal contents in accordance with the procedures adopted by Statistics Canada and the Ministry of Energy, Mines and Petroleum Resources.

Since 1974 the total quantity and value of metal production include the quantities paid for to the mines, and the smelter and refinery production that can be attributed to the mines but is not paid for. The quantity and value paid for to the mines, excluding outward

transportation costs, smelting and refining costs, and penalties and deductions, are shown separately for comparative purposes.

INDUSTRIAL MINERALS AND STRUCTURAL MATERIALS

The values of production of industrial minerals and structural materials are approximately the amounts received at the point of origin.

COAL

The value of production of coal is calculated using a price per tonne which is the weighted average of the f.o.b. prices at the mine for the coal sold.

PETROLEUM AND NATURAL GAS

The values of production of natural gas, natural gas liquid by-products, and petroleum including condensate/pentanes plus are the amounts received for the products at the well head.

MINERAL AND PETROLEUM PRODUCTS IN BRITISH COLUMBIA

Antimony—Antimony metal was produced at the Trail smelter from 1939 to 1944; since 1944 it has been marketed alloyed with lead. The antimony is a by-product of silver-lead ores. In 1907 the first recorded antimonial ore mined in British Columbia was shipped from the Slocan area to England. Since then other out-of-province shipments have originated in the Bridge River, North Lardeau, Slocan, Spillimacheen, and Stuart Lake areas. In Table 3-7C the antimony assigned to individual mining divisions is the reported content of ore exported to foreign smelters; the antimony "not assigned" is that recovered at the Trail smelter from various ores received there. *See* Tables 3-1, 3-3, and 3-7C.

Arsenious oxide—Arsenious oxide was recovered at foreign smelters from arsenical gold ores from Hedley between 1917 and 1931, and in 1942, and from the Victoria property on Rocher Déboulé Mountain in 1928. No production has been recorded since 1942. *See* Tables 3-1 and 3-7D.

Asbestos—British Columbia has produced asbestos since 1952 when the Cassiar mine was opened. All British Columbia production consists of chrysotile from the Cassiar mine near the Yukon boundary. This deposit is noted for its high percentage of valuable long fibre and for the low iron content of the fibre. The original claims were located at Cassiar in 1950, and the first fibre was shipped two years later. The fibre is milled from the ore at Cassiar and now most is shipped by truck to Stewart. From 1953 to 1961 the fibre was valued at the shipping point in North Vancouver, but beginning in 1962 it has been valued at the mine, and values for the preceding years have been recalculated on that basis. *See* Tables 3-1, 3-3, and 3-7D.

Barite—Barite production began in 1940 and has been continuous since then, coming from several operations in the upper Columbia River valley. Some barite has been mined from lode deposits and the rest recovered from the mill-tailings ponds of the former Silver Giant and Mineral King silver-lead-zinc mines. *See* Table 3-7D.

Bentonite—Small amounts of bentonite were produced between 1926 and 1944 from deposits in the coal measures near Princeton. There has been no production since 1944. *See* Tables 3-1 and 3-7D.

Bismuth—Since 1929 the Trail smelter has produced bismuth. It is a by-product of lead refining and thus the production cannot be assigned to specific properties or mining divisions. *See* Tables 3-1, 3-3, and 3-7C.

Brick—*See* Clay and shale products.

Building-stone—Dimensional stone for building purposes is quarried when required from a granite deposit on Nelson Island and an andesite deposit on Haddington Island. Other stone close to local markets is quarried periodically or as needed for special building projects. *See* Tables 3-1, 3-3, and 3-7E.

Butane—Butane is recovered as a by-product at the gas-processing plant at Taylor and at oil refineries. *See* Tables 3-1, 3-3, and 3-7A.

Cadmium—Cadmium has been recovered as a by-product at the Trail zinc refinery since 1928. It occurs in variable amounts in the sphalerite of most British Columbia silver-lead-zinc ores. In Table 3-7C the cadmium assigned to individual mining divisions is the reported content of custom shipments to the Trail and foreign smelters; that "not assigned" is the remainder of the reported estimated recovery at the Trail smelter from British Columbia concentrates. *See* Tables 3-1, 3-3, and 3-7C.

Cement—Cement is manufactured from carefully proportioned mixtures of limestone, gypsum, and other mineral materials. It has been produced in British Columbia since 1905. Present producers are Inland Cement Industries Ltd., with a 907 180-tonnes-per-year plant on Tilbury Island, and a 490 000-tonnes-per-year plant at Bamberton, and Canada Cement Lafarge Ltd., with a 476 000-tonnes-per-year plant on Lulu Island and a 191 000-tonnes-per-year plant at Kamloops. *See* Tables 3-1, 3-3, and 3-7E.

Chromite—Two shipments of chromite are on record, 608 tonnes from Cascade in 1918 and 114 tonnes from Scottie Creek in 1929. *See* Tables 3-1 and 3-7C.

Clay and shale products—These include brick, blocks, tile, pipe, pottery, lightweight aggregate, and pozzolan manufactured from British Columbia clays and shales. Common red-burning clays and shales are widespread in the province, but better grade clays are rare. The first recorded production was of bricks at Craigflower in 1853 and since then plants have operated in most towns and cities for short periods. Local surface clay is used at Haney to make common red brick, tile, and flower pots. Shale and fireclay from Abbotsford Mountain are used to make firebrick, facebrick, sewer pipe, flue lining, and special fireclay shapes in plants at Kilgard, Abbotsford, and South Vancouver. A plant at Quesnel makes pozzolan from burnt shale quarried south of Quesnel. Several hobby and art potteries and a sanitary-ware plant are in operation, but these use mainly imported raw materials and their production is not included in the tables. *See* Tables 3-1, 3-3, and 3-7E.

Coal—Coal is almost as closely associated with British Columbia's early history as is placer gold. Coal was discovered at Suquash on Vancouver Island in 1835 and at Nanaimo in 1850. The yearly value of coal production passed that of placer gold in 1883 and contributed a major part of the total mineral wealth for the next 30 years.

First production, by mining divisions: Cariboo, 1942; Fort Steele, 1898; Kamloops, 1893; Liard, 1923; Nanaimo, 1836; Nicola, 1907; Omineca, 1918; Osoyoos, 1926; Similkameen, 1909; and Skeena, 1912.

The Nanaimo and Comox fields produced virtually all of the coal until production started from the Crowsnest field in 1898. The Crowsnest field contains coking coal and prospered in the early years of smelting and railroad building. Mining started in the Nicola-Princeton Coalfield in 1907, at Telkwa in 1918, and on the Peace River in 1923. The Nanaimo field was exhausted in 1953 when the last large mines closed, and only small operations on remnants were left. The colliery at Merritt closed in 1945 and at Coalmont in 1940. The closing of the large mine at Tsable River in 1966, and the last small one, near Wellington in 1968, marked the end of continuous production from the important Vancouver Island deposits. Recent exploration indicates the possibility of renewed coal mining on the island.

Undeveloped fields include basins in the foothills of the Rocky Mountains south of the Peace River, the Groundhog basin in north-central British Columbia, the Hat Creek basin west of Ashcroft, and Sage Creek basin southeast of Fernie.

The enormous requirements for coking coal in Japan created intense exploration in various areas of British Columbia since 1968. The signing of large contracts with the Japanese resulted in preparations for production at several deposits in the East Kootenays. First shipments to Japan via special port facilities at North Vancouver and Roberts Bank began in 1970.

All the coal produced, including that used in making coke, is shown as primary mine production. Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. From 1910 the quantity is the amount sold and used, which includes sales to retail and wholesale dealers, industrial users, and company employees; coal used under company boilers, including steam locomotives; and coal used in making coke. *See* Tables 3-1, 3-3, 3-7A. 3-8A, and 3-8B.

Cobalt—In 1928 a recovery of 1,730 pounds of cobalt was made from a shipment of arsenical gold ore from the Victoria mine on Rocher Déboulé Mountain. From 1971 to 1973, cobalt was shipped from the Pride of Emory mine at Hope. *See* Tables 3-1 and 3-7C.

Coke—Coke is made from special types of coal. It has been produced in British Columbia since 1895. Being a manufactured product, its value does not contribute to the total mineral production as shown in Table 3-1. Up to 1966, coke statistics had been included in the Annual Report at Table 3-9, but this table has been discontinued. The coal used in making coke is still recorded in Table 3-8B.

Condensate—(a) *Field*—Field condensate is the liquid hydrocarbons separated and recovered from natural gas in the field before gas processing. (b) *Plant*—Plant condensate is the hydrocarbon liquid extracted from natural gas at gas-processing plants. *See* Tables 3-1, 3-3, and 3-7A.

Copper—From 1935 to 1978 no copper smelter operated in British Columbia and most of the copper concentrates were shipped to Japanese, eastern Canadian, and American smelters. In 1978, Afton Mines Ltd. started producing blister copper from its own concentrates. Most of the smelting in British Columbia in early years was done on ore shipped directly from the mines without concentration, but modern practice is to concentrate the ore first. Small amounts of gold and silver are commonly present and add value to the ore.

Ore was smelted in British Columbia first in 1896 at Nelson (from Silver King mine) and at Trail (from Rossland mines), and four and five years later at Grand Forks (from Phoenix mine) and Greenwood (from Mother Lode mine). Later, small smelters were built in the Boundary district and on Vancouver and Texada Islands, and in 1914 the Anyox smelter was blown in. Copper smelting ceased in the Boundary district in 1919, at Trail in 1929, and at Anyox in 1935. British Columbia copper concentrates were then smelted mainly at Tacoma, and since 1961 have gone chiefly to Japan.

Most of the production has come from southern British Columbia—from Britannia, Copper Mountain, Greenwood, Highland Valley, Merritt, Nelson, Rossland, Texada Island, and Vancouver Island, although a sizable amount came from Anyox and some from Tulsequah. During the 1960's, exploration for copper became intense, interest being especially directed toward finding very large, low-grade deposits suitable for open-pit mining. The activity has resulted in the establishment of operating mines at Merritt (Craigmont) in 1961, in Highland Valley (Bethlehem) in 1962, on Babine Lake (Granisle) in 1966, near Peachland (Brenda) in 1970, Stewart (Granduc)—closed mid-1978 but reopened in late 1980, near Port Hardy (Island Copper) in 1971, near Babine Lake (Bell), McLeese Lake (Gibraltar), Highland Valley (Lornex), Princeton (Ingerbelle) in 1972, and near Kamloops (Afton) in 1977. *See* Table 3-12 for a complete list of copper producers.

Some of these mines produce molybdenum as a by-product, for example, Bethlehem, Brenda, Lornex, Gibraltar, and Island Copper. Copper is also produced as a by-product of iron mining at Tasu Sound, Queen Charlotte Islands (Wesfrob), and with ores containing zinc, gold, silver, lead, and cadmium at Buttle Lake (Lynx and Myra, Western Mines).

Copper has been the most valuable single commodity of the industry since 1966 except in 1977 and 1979 when it was surpassed marginally by natural gas. *See* Tables 3-1, 3-3, 3-6, and 3-7B.

Crude oil—Production of crude oil in British Columbia began in 1955 from the Fort St. John field, but was not significant until late in 1961, when the oil pipeline was built to connect the oil-gathering terminal at Taylor to the Trans Mountain Oil Pipe Line Company pipeline near Kamloops.

In Tables 3-1, 3-3, and 3-7A, quantities given prior to 1962 under "petroleum, crude" are total sales, but since 1962 the field and plant condensates are listed separately. Table 3-14 incorporates all revisions since the commencement of production.

Diatomite—Relatively large deposits of diatomite are found near the Fraser River in the Quesnel area, and small deposits are widespread throughout the province. Small amounts of diatomite have been shipped from Quesnel periodically since 1928. A plant to process the material is located in Quesnel. *See* Table 3-7D.

Fluorite (fluorspar)—Between 1918 and 1929, fluorite was mined at the Rock Candy mine north of Grand Forks for use in the Trail lead refinery. From 1958 to 1968, small quantities were produced as a by-product at the Oliver silica quarry. *See* Table 3-7D.

Flux—Silica and limestone are added to smelter furnaces as flux to combine with impurities in the ore and from a slag which separates from the valuable metal. In the past, silica was shipped from Grand Forks, Oliver, and the Sheep Creek area. Today, silica from near Kamloops and limestone, chiefly from Texada Island, are produced for flux. Quantities have been recorded since 1911. *See* Tables 3-1, 3-3, and 3-7D.

Gold, lode—Gold has played an important part in mining in the province. The first discovery of lode gold was on Morseby Island in 1852, when some gold was recovered from a small quartz vein. The first stamp mill was built in the Cariboo in 1876, and it seems certain that some arrastras (primitive grinding mills) were built even earlier. These and other early attempts were short-lived, and the successful milling of gold ores began about 1890 in the southern part of the province. By 1900 the value of gold production was second only to that of coal. At the start of World War II, gold mining attained a peak yearly value of more than $22 million, but since the war it has dwindled until developments in the 1970s.

In the early years, lode gold came mostly from the camps of Rossland, Nelson, McKinney, Fairview, Hedley, and also from the copper and other ores of the Boundary district. A somewhat later major producer was the Premier mine at Stewart. In the 1930's the price of gold increased and the value of production soared, new discoveries were made and old mines were revived. The principal gold camps, in order of output of gold, have been Bridge River, Rossland, Portland Canal, Hedley, Wells, and Sheep Creek. In 1971 the Bralorne mine at Bridge River closed.

With the closing of the Bralorne mine, most of the lode gold is produced as a by-product of copper, copper-zinc-silver, and othe. base metal mining. Because of the volume of this production the amount of gold produced is still at a fairly high level, and with the significant rise in the price of gold in the 1970's the value of production has exceeded the peaks reached during the era of gold mines in the 1930's. *See* Tables 3-1, 3-3, 3-6, and 3-7B. *See* Table 3-12 for a complete list of current producers.

Gold, placer—The early explorations and settlement of the province followed rapidly on the discovery of gold-bearing placer creeks throughout the country. The first placer-miners came in 1858 to mine the lower Fraser River bars upstream from Yale.

The year of greatest placer-gold production was 1863, shortly after the discovery of the placer in the Cariboo. Another peak year in 1875 marked the discovery of placer on creeks in the Cassiar. A minor peak year was occasioned by the discovery of placer gold in the Granite Creek in the Tulameen in 1885. A high level of production ensued after 1899, when the Atlin placers reached their peak output. Other important placer-gold camps were established at Goldstream, Fort Steele, Rock Creek, Omineca River, and Quesnel River. The last important strike was made on Cedar Creek in 1921, and coarse gold was found on Squaw Creek in 1927 and on Wheaton Creek in 1932.

Mining in the old placer camps revived during the 1930s under the stimulus of an increase in the price of fine gold from $20.67 per ounce to $35 per ounce in United States funds. Since World War II, placer mining declined under conditions of steadily rising costs and a fixed price for gold but is showing signs of revival in response to a freely floating gold price since 1972. Since 1858, more than 163 674 000 grams valued $107.3 million has been recovered.

A substantial part of the production, including much of the gold recovered from the Fraser River upstream from Yale (in the present New Westminster, Kamloops, and Lillooet Mining Divisions) and much of the early Cariboo production, was mined before the original organization of the Department of Mines in 1874. Consequently, the amounts recorded are based on early estimates and cannot be accurately assigned to individual mining divisions.

The first year of production for major placer-producing mining divisions was: Atlin, 1898; Cariboo, 1859; Liard, 1873; Lillooet, 1858; Omineca, 1869.

In 1965, changes were made in the allocation of placer gold in New Westminster and Similkameen Mining Divisions and "not assigned," to reconcile those figures with data incorporated in Bulletin 28, *Placer Gold Production of British Columbia*. *See* Tables 3-1, 3-3, 3-6, and 3-7A.

Granules—Rock chips used for bird grits, exposed aggregate, roofing, stucco, dash, terrazzo, etc., have been produced in constantly increasing quantities since 1930. Plants operate in Burnaby and near Grand Forks, Sirdar, Vananda, and Armstrong. *See* Tables 3-1, 3-3, and 3-7D.

Gypsum and gypsite—Production of gypsum and gypsite has been recorded since 1911. Between 1925 and 1956, more than 907 000 tonnes were shipped from Falkland and some was quarried near Cranbrook and Windermere. Since 1956, nearly all production has come from Windermere. *See* Tables 3-1, 3-3, and 3-7D.

Hydromagnesite—Small shipments of hydromagnesite were made from Atlin between 1904 and 1916 and from Clinton in 1921. *See* Tables 3-1 and 3-7D.

Indium—Production of indium as a by-product of zinc refining at the Trail smelter began in 1942. Production figures have not been disclosed since 1958.

Iron—Iron ore was produced in small quantities as early as 1885, commonly under special circumstances or as test shipment. Steady production started in 1951 with shipments of magnetite concentrates to Japan from Vancouver and Texada Islands.

Most of the known iron-ore deposits are magnetite, and occur in the coastal area. On the average they are low in grade and need to be concentrated. Producing mines have operated on Texada Island, at Benson Lake and Zeballos on Vancouver Island, and at Tasu and Jedway on Morseby Island. At Texada Island copper was a by-product of iron mining, and in the Coast Copper mine at Benson Lake iron was a by-product of copper mining. The latest operation, and to date the largest, is that of Wesfrob Mines Limited at Tasu, begun at the end of 1967; copper is produced as a by-product.

From January 1961 to August 1972, calcined iron sulphide from the tailings of the Sullivan mine was used for making pig iron at Kimberley. This was the first manufacture of pig iron in British Columbia. The iron occurs as pyrrhotite and pyrite in the lead-zinc ore of the Sullivan mine. In the process of milling, the lead and zinc minerals are separated for shipment to the Trail smelter, and the iron sulphides are separated from the waste rock. Over the years a stockpile has been built containing a reserve of about 18 million tonnes of iron ore.

The sulphur was removed in making pig iron and was converted to sulphuric acid, which was used in making fertilizer. A plant built at Kimberley converted the pig iron to steel, and a fabricating plant was acquired in Vancouver. The iron smelter at Kimberley

closed in August 1972. The entire production, credited to the Fort Steele Mining Division in Table 3-7C, is of calcine. *See* Tables 3-1, 3-3, 3-6, and 3-7C.

Iron oxide—Iron oxide, ochre, and bog iron were mined as early as 1918 from several occurrences, but mainly from limonite deposits north of Squamish. None has been produced since 1950. *See* Tables 3-1 and 3-7D.

Jade (nephrite)—Production of jade (nephrite) has been recorded only since 1959 despite there being several years of significant production prior to that date. The jade is recovered from bedrock occurrences on Mount Ogden and near Dease Lake and as alluvial boulders from the Fraser River; the Bridge River and its tributaries, Marshall, Hell, and Cadwallader Creeks; O'Ne-ell, Ogden, Kwanika, and Wheaton Creeks. *See* Tables 3-1, 3-3, and 3-7D.

Lead—Lead was the most valuable single commodity for many years, but it was surpassed in value of annual production by zinc in 1950, by copper in 1966, by molybdenum in 1969, and in total production by zinc in 1966. Lead and zinc usually occur together in nature although not necessarily in equal amounts in a single deposit. Zinc is the more abundant metal, but lead ore usually is more valuable than zinc ore because it contains more silver as a by-product. For a long time British Columbia produced almost all of Canada's lead, but now produces about 28 per cent of the total. All of the concentrated ore was smelted and the metal refined at Trail in 1980.

Almost all of British Columbia's lead comes from the southeastern part of the province. The Sullivan mine at Kimberley is now producing about 90.5 per cent of the province's lead and has produced about 85.9 per cent of the grand total. This is one of the largest mines in the world and supports the great metallurgical works at Trail. Other mines are at Pend-d'Oreille River, North Kootenay Lake, Slocan, southwestern British Columbia, and Vancouver Island. In northwestern British Columbia less important parts of the total output have come from Tulsequah, the Premier mine, and several small mines in the general region of Hazelton. *See* Table 3-12 for the current lead producers.

A small amount of high-grade lead ore is shipped directly to the smelter, but most of the ore is concentrated by flotation and the zinc content is separated from the lead. All output from the Sullivan goes to the Trail smelter. Lead was first produced in 1887, and the total production amounts to approximately 8.0 million tonnes.

In 1958, revisions were made in some yearly totals for lead to adjust them for recovery of lead from slag treated at the Trail smelter. *See* Tables 3-1, 3-3, 3-6, and 3-7B.

Limestone—Besides being used for flux and granules (where it is recorded separately), limestone is used in agriculture, cement manufacture, the pulp and paper industry, and for making lime. It has been produced since 1886. Quarries now operate at Cobble Hill, near Prince George, at Kamloops, and on the north end of Texada Island. *See* Tables 3-1, 3-3, and 3-7E.

Magnesium—In 1941 and 1942, Cominco Ltd. produced magnesium from magnesite mined from a large deposit at Marysville. *See* Tables 3-1 and 3-7C.

Magnesium sulphate—Magnesium sulphate was recovered in minor amounts at various times between 1915 and 1942 from small alkali lakes near Basque, Clinton, and Osoyoos. *See* Tables 3-1 and 3-7D.

Manganese—From 1918 to 1920, manganese ore was shipped from a bog deposit near Kaslo and from Hill 60 near Cowichan Lake, and in 1956 a test shipment was made from Olalla. *See* Tables 3-1 and 3-7C.

Mercury—Mercury was first produced near Savona in 1895. Since then small amounts have been recovered from the same area and from the Bridge River district. The

main production to date was between 1940 and 1944 from the Pinchi Lake and Takla mines near Fort St. James. In 1968 the Pinchi Lake mine reopened and continued in operation until 1975 when it closed because of market situations. *See* Tables 3-1 and 3-7C.

Mica—No sheet mica has been produced commercially in British Columbia. Between 1932 and 1961, small amounts of mica schist for grinding were mined near Albreda, Armstrong, Oliver, Prince Rupert, and Sicamous. *See* Tables 3-1 and 3-7D.

Molybdenum—Molybdenum ore in small amounts was produced from high-grade deposits between 1914 and 1918. Recently, mining of large low-grade molybdenum and copper-molybdenum deposits has increased production to the point that molybdenum now ranks second in importance in annual value of metals produced in British Columbia. The upswing began when the Bethlehem mine recovered by-product molybdenum from 1964 to 1966, commencing again in 1978. In 1965 the Endako and Boss Mountain mines, followed by the Coxey in 1966, and British Columbia Molybdenum mine in 1967, all began operations as straight molybdenum producers. The Boss Mountain mine closed in 1971 and reopened late in 1973. The Coxey and British Columbia Molybdenum mines closed in 1971 and 1972 respectively. In 1970 the Brenda mine, a combined copper-molybdenum producer, started operating, and Island Copper in 1971, and Lornex in 1972, while Gibraltar ceased molybdenum production in 1975 but recommenced in 1977. *See* Tables 3-1, 3-3, 3-6, and 3-7C.

Natro-alunite—In 1912 and 1913, 363 tonnes of natro-alunite was mined from a small low-grade deposit at Kyuquot Sound. There has been no subsequent production. *See* Tables 3-1 and 3-7D.

Natural gas—Commercial production of natural gas began in 1954 to supply the community of Fort St. John. In 1957 the gas plant at Taylor and the pipeline to serve British Columbia and the northwestern United States was completed.

The production shown in Tables 3-1, 3-3, 3-7A, and 3-14, is the total amount sold of residential gas from processing plants plus dry and associated gas from the gas-gathering system; that is, the quantity delivered to the main transmission-line. The quantity is net after deducting gas used on leases, metering difference, and gas used or lost in the cleaning plant. The quantity is reported as millions of cubic metres at standard condition [99.2 kPa (kilopascals) pressure, 15°C temperature, up to and including the year 1960, and thereafter 101.3 kPa pressure, 15°C temperature].

Full details of gross well output, other production, delivery, and sales are given in the tables printed in the Annual *Summary of Operations, Petroleum Resources Branch*.

Nickel—One mine, the Pride of Emory near Hope, shipped nickel ore in 1936 and 1937 and began continuous production in 1958. From 1960 to 1974, bulk copper and nickel concentrates have been shipped to Japan and Alberta respectively for smelting. The mine closed in August 1974. *See* Tables 3-1, 3-3, and 3-7C.

Niobium—Niobium was produced from placer deposits on Vowell and Malloy Creeks in the Bugaboo area in 1956. A test shipment of 8 187 tonnes of gravel was shipped by St. Eugene Mining Corporation Limited to Quebec Metallurgical Industries. The placer contained a variety of minerals, including pyrochlore and uraninite. Recovery from the test shipment was as follows: 104.39 kilograms of niobium and 146.29 kilograms of uranium and thorium.

Palladium—Palladium was recovered in 1928, 1929, and 1930 as a by-product of the Trail refinery and is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. *See* Tables 3-1 and 3-7C.

Perlite—In 1953 a test shipment of 1 009 tonnes was made from a quarry on François Lake. There has been no further production. *See* Tables 3-1 and 3-7D.

Petroleum, crude—*See* Crude oil.

Phosphate Rock—Between 1927 and 1933, Cominco Ltd. produced 3 485 tonnes of phosphate rock for test purposes, but the grade proved to be too low for commercial use. More test shipments were made in 1964, but there has been no commercial production. *See* Tables 3-1 and 3-7D.

Platinum—Platinum has been produced intermittently from placer streams in small amounts since 1887, mostly from the Tulameen and Similkameen Rivers. Placer platinum also has been recovered from Pine, Thibert, McConnell, Rainbow, Tranquille, Rock, and Government Creeks; from Quesnel, Fraser, Cottonwood, Peace, and Coquihalla Rivers; and from beach placers on Graham Island. Some platinum recovered between 1928 and 1930 as a by-product at the Trail refinery is presumed to have originated in copper concentrates shipped to the smelter from the Copper Mountain mine. *See* Tables 3-1, 3-3, and 3-7C. Small amounts were contained in the placer gold in 1979.

Propane—Propane is recovered from gas-processing plants at Taylor and Boundary Lake, and at oil refineries. *See* Tables 3-1, 3-3, and 3-7A.

Rhenium—Rhenium occurs in significant quantities only with molybdenite associated with prophyry copper deposits. It was first produced in 1972 by the Island Copper mine and is extracted as rhenium oxide from fumes produced during roasting of the molybdenite concentrate.

Rock—Production of rubble, riprap, and crushed rock has been recorded since 1909. *See* Tables 3-1, 3-3, and 3-7E.

Sand and gravel—Sand and gravel is used as aggregate in concrete work. The output varies from year to year according to the level of activity in the construction industry. *See* Tables 3-1, 3-3, and 3-7E.

Selenium—The only recorded production of selenium, 332 kilograms, was in 1931 from the refining of blister copper from the Anyox smelter. *See* Tables 3-1 and 3-7C.

Silver—Silver is recovered from silver ores or as a by-product of other ores. Most of it is refined in Trail, and some is exported in concentrated ores of copper, lead, and zinc to American and Japanese smelters. Silver bullion was produced by the Torbit mine from 1949 to 1959.

Some silver is associated with galena, while other is recovered from gold and copper ores, and although the silver in such ores is usually no more than a fraction of an ounce per tonne, even that amount is important in a large tonnage operation.

Production of silver began in 1887 from silver-copper and silver-lead ores in the Kootenays and has continued in this area to the present. Now, most of the silver is a by-product of lead-zinc ores and nearly all is refined at Trail, although some is exported with concentrates to American and Japanese smelters. Today the greatest single source of silver is the Sullivan mine, which has been in production since 1900. By 1980 the Sullivan mine has accounted for 46 per cent of the total silver production of the province. A significant total amount is contributed by the Lynx, Lornex, Island Copper, Afton, Silmonac, and Granisle mines. Table 3-12 details the current silver production. The only steady producer that is strictly a silver mine is the Highland Bell mine at Beaverdell, in operation since 1922. A former important mine, the Premier near Stewart, produced more than 1.3 million kilograms of silver between 1918 and 1968. *See* Tables 3-1, 3-3, 3-6, and 3-7B.

In 1980, silver totals include 79 344 grams, valued at $41,920, recovered and paid for in the placer gold.

Sodium carbonate—Sodium carbonate was recovered between 1921 and 1949 from alkali lakes in the Clinton area and around Kamloops. There has been no further production. *See* Tables 3-1 and 3-7D.

Stone (see Building-stone)—Cut stone for building purposes is prepared from rock produced at quarries in various parts of the province when required. Two of the most productive quarries have operated on Haddington and Nelson Islands. *See* Tables 3-1, 3-3, and 3-7E.

Structural materials—In Table 3-7E the value of $5 972 171 for unclassified materials is the total for structural materials in the period 1886–1919 that cannot be allotted to particular classes of structural materials or assigned to mining divisions, and includes $726 323 shown against 1896 in Table 3-2 that includes unclassified structural materials in that and previous years not assignable to particular years. The figure $3 180 828 in Table 3-7E under "Other Clay Products" is the value in the period 1886–1910 that cannot be allotted to particular clay products or assigned to mining divisions. *See* Tables 3-1, 3-2, 3-3, 3-7A, and 3-7E.

Sulphur—The production of sulphur has been recorded since 1916. From 1916 to 1927 the amounts include the sulphur content of pyrite shipped. From 1928 the amounts include the estimated sulphur content of pyrite shipped, plus the sulphur contained in sulphuric acid made from waste smelter gases. The sulphur content of pyrrhotite roasted at the Kimberley fertilizer plant is included since 1953. Elemental sulphur has been recovered from the Westcoast Transmission Co. Ltd. plant at Taylor since 1958 and the Fort Nelson plant of Petrosul International Ltd. since 1978. *See* Tables 3-1, 3-3, and 3-7D.

Talc—Between 1916 and 1936, talc was quarried at Leech River and at Anderson Lake to make dust for asphalt roofing. There has been no production since 1936. *See* Tables 3-1 and 3-7D.

Thorium—*See* Niobium.

Tin—Tin, as cassiterite, is a by-product of the Sullivan mine, where it has been produced since 1941. Tin is also produced in a lead-tin alloy at the Trail smelter. *See* Tables 3-1, 3-3, and 3-7C.

Tungsten—Tungsten, very largely as scheelite concentrates, was produced from 1937 to 1958, first from the Columbia Tungstens (Hardscrabble) mine in the Cariboo in 1937 and during World War II from the Red Rose mine near Hazelton and the Emerald mine near Salmo. The Red Rose closed in 1954 and the Emerald in 1958. Small amounts of scheelite have been produced from the Bridge River, Revelstoke, and other areas where demand was high. In 1970, production began from the Invincible mine near Salmo, which closed in 1973.

A very small amount of wolframite came from Boulder Creek near Atlin. *See* Tables 3-1, 3-3, and 3-7C.

Uranium—*See* Niobium.

Volcanic ash—The only recorded production of volcanic ash is 27 tonnes from the Cariboo Mining Division in 1954. *See* Table 3-7D.

Zinc—Zinc was first produced in 1905. For many years lead was the most valuable single metal, but in 1950 the annual value of production of zinc surpassed that of lead and in 1966 the total value of copper production exceeded that of zinc. In 1977 the production

of zinc was exceeded by that of copper, molybdenum, asbestos, coal, crude oil, and natural gas. Zinc is invariably associated with lead, and most ores are mined for their combined values in zinc, lead, and silver, and rarely for their zinc content alone. Some zinc ores contain a valuable amount of gold, and zinc is associated with copper at Lynx mine. Modern practice is to concentrate and separate the zinc mineral (sphalerite) from the lead mineral (galena). Most of the zinc concentrates go to the zinc-recovery plant at Trail, are roasted, and are converted electronically to refined metal. Usually some concentrates are shipped to American or Japanese smelters.

About 84 per cent of the zinc that has been mined in British Columbia has originated in southeastern British Columbia, at the Sullivan mine, and at mines near Ainsworth, Invermere, Moyie Lake, Riondel, Salmo, Slocan, and Spillimacheen. Other production has come from mines at Portland Canal and Tulsequah and is coming from Buttle Lake and Callaghan Creek. The greatest zinc mine is the Sullivan, which contributed about 72 per cent of the total zinc production of the province. *See* Table 3-12 for details of current zinc producers.

Records for the period 1905 to 1908 show shipments totalling 17 096 tonnes of zinc ore and zinc concentrates of unstated zinc content. In 1918, revisions were made to some yearly totals for zinc to adjust them for recovery of zinc from slag treated at the Trail smelter. *See* Tables 3-1, 3-3, 3-6, and 3-7B.

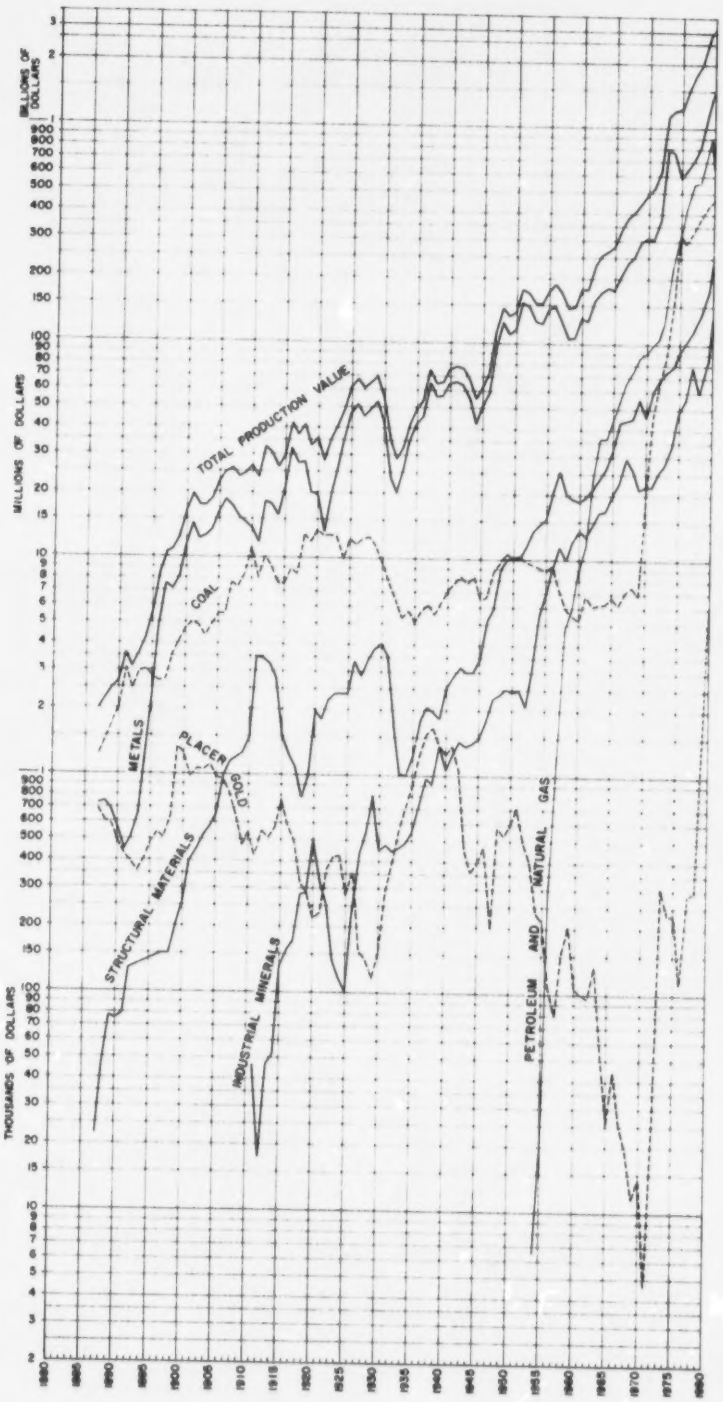

Figure 3-1 — Value of mineral production, 1887–1980

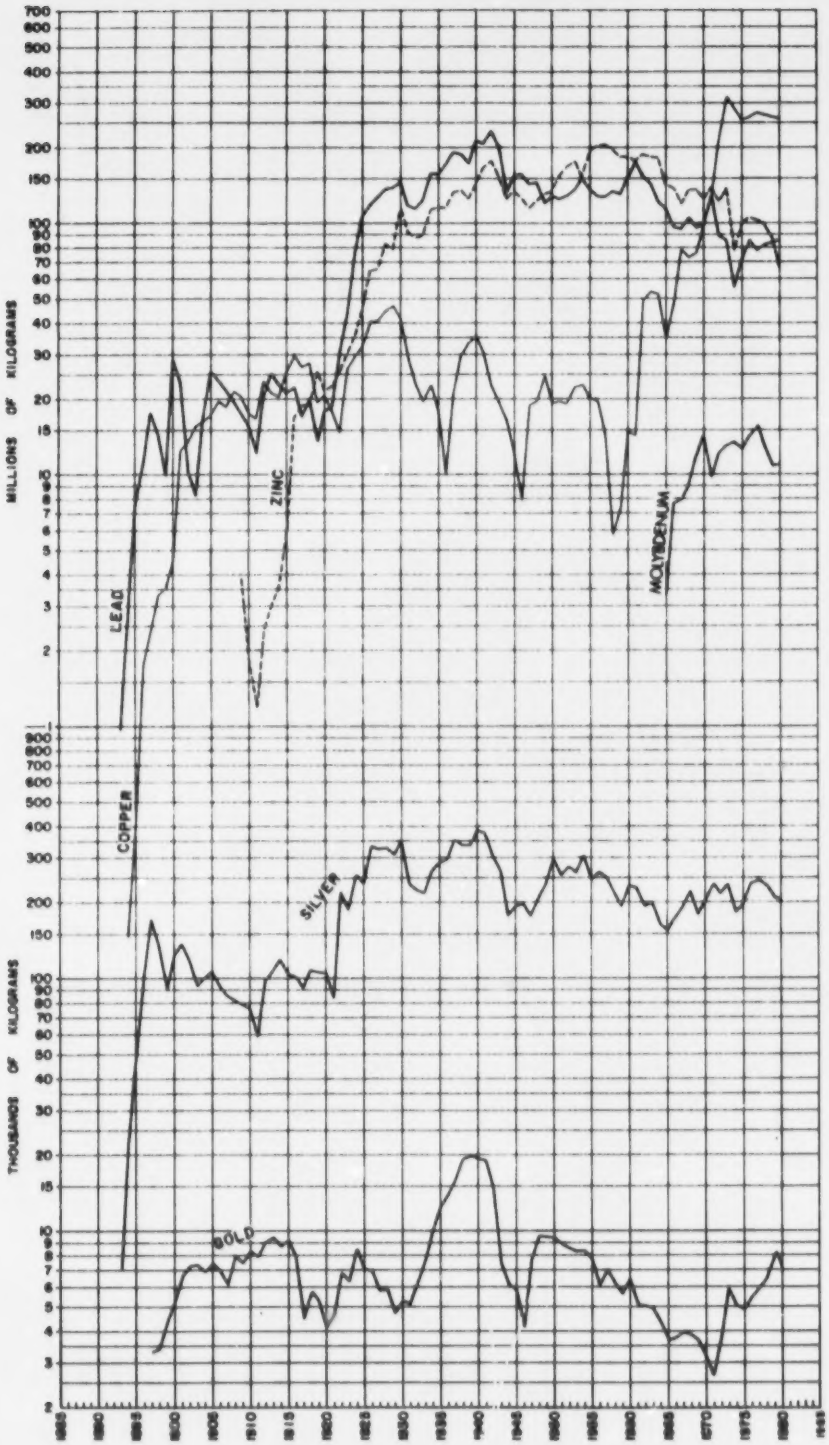

Figure 3-2—Production quantities of gold, silver, copper, lead, zinc, and molybdenum, 1893–1980.

Prices[1] Used in Valuing Production of Gold, Silver, Copper, Lead, Zinc, and Coal

Year	Gold, Fine	Silver, Fine	Copper	Lead	Zinc	Coal
	$/g	$/g	$/kg	$/kg	$/kg	$/t
1901	0.66457	0.01801 N.Y.	0.355 N.Y.	0.057 N.Y.	.....	2.92
1902	..	.01593 ..	.258 ..	.081 ..	.....	2.90
1903	..	.01633 ..	.292 ..	.084 ..	.....	2.94
1904	..	.01716 ..	.283 ..	.086 ..	.....	2.89
1905	..	.01650 ..	.344 ..	.094 ..	.....	2.98
1906	..	.02040 ..	.425 ..	.106 ..	.....	2.88
1907	..	.01995 ..	.441 ..	.106 ..	.....	3.38
1908	..	.01615 ..	.291 ..	.083 ..	.....	3.43
1909	..	.01573 ..	.286 ..	.085 ..	.....	3.52
1910	..	.01634 ..	.281 ..	.088 ..	0.101 E. St. L.	3.69
1911	..	.01628 ..	.273 ..	.088 ..	.108 ..	3.51
1912	..	.01858 ..	.360 ..	.089 ..	.130 ..	3.70
1913	..	.01826 ..	.337 ..	.087 ..	.106 ..	3.74
1914	..	.01675 ..	.300 ..	.077 ..	.097 ..	3.69
1915	..	.01518 ..	.381 ..	.092 ..	.248 ..	3.78
1916	..	.02006 ..	.600 ..	.136 ..	.240 ..	3.80
1917	..	.02487 ..	.599 ..	.174 ..	.167 ..	3.84
1918	..	.02956 ..	.543 ..	.147 ..	.153 ..	5.50
1919	..	.03394 ..	.412 ..	.114 ..	.138 ..	5.42
1920	..	.03080 ..	.385 ..	.158 ..	.144 ..	5.20
1921	..	.01914 ..	.276 ..	.090 ..	.087 ..	5.30
1922	..	.02062 ..	.295 ..	.114 ..	.107 ..	5.20
1923	..	.01981 ..	.318 ..	.144 ..	.124 ..	5.30
1924	..	.02040 ..	.287 ..	.161 ..	.119 ..	5.39
1925	..	.02221 ..	.310 ..	.173 Lond	.174 Lond	5.28
1926	..	.01997 ..	.304 ..	.149 ..	.163 ..	5.34
1927	..	.01812 ..	.285 ..	.116 ..	.137 ..	5.30
1928	..	.01870 ..	.321 ..	.101 ..	.121 ..	5.19
1929	..	.01704 ..	.399 ..	.111 ..	.119 ..	5.22
1930	..	.01227 ..	.286 ..	.087 ..	.079 ..	5.21
1931	..	.00923 ..	.179 ..	.060 ..	.056 ..	4.80
1932	.75459	.01018 ..	141 Lond	.047 ..	.053 ..	4.45
1933	.91953	.01216 ..	.164 ..	.053 ..	.071 ..	4.30
1934	1.10922	.01526 ..	.164 ..	.054 ..	.067 ..	4.41
1935	1.13140	.02083 ..	.172 ..	.069 ..	.068 ..	4.35
1936	1.12626	.01451 ..	.209 ..	.086 ..	.073 ..	4.66
1937	1.12497	.01443 ..	.288 ..	.113 ..	.108 ..	4.68
1938	1.13108	.01398 ..	.220 ..	.074 ..	.068 ..	4.42
1939	1.16195	.01302 ..	.223 ..	.070 ..	.068 ..	4.43
1940	1.23782	.01230 ..	.222 ..	.074 ..	.075 ..	4.70
1941	1.23782	.01230 ..	.222 ..	.074 ..	.075 ..	4.57
1942	1.23782	.01324 ..	.222 ..	.074 ..	.075 ..	4.55
1943	1.23782	.01455 ..	.259 ..	.083 ..	.088 ..	4.60
1944	1.23782	.01383 ..	.265 ..	.099 ..	.095 ..	4.68
1945	1.23782	.01511 ..	.277 ..	.110 ..	.142 ..	4.67
1946	1.18156	.02689 ..	.282 ..	.149 ..	.172 ..	5.16
1947	1.12529	.02315 ..	.450 ..	.301 ..	.248 ..	5.64
1948	1.12529	.02411 Mont.	.493 U.S.	.398 ..	.307 ..	6.71
1949	1.15744	.02387 U.S.	.440 ..	.348 U.S.	.292 U.S.	7.18
1950	1.22335	.02593 ..	.517 ..	.319 ..	.332 ..	7.09
1951	1.18477	.03040 ..	.611 ..	.406 ..	.439 ..	7.12
1952	1.10182	.02674 ..	.685 ..	.355 ..	.350 ..	7.65
1953	1.10665	.02693 ..	.669 ..	.292 ..	.235 ..	7.58
1954	1.09539	.02668 ..	.642 ..	.302 ..	.230 ..	7.72
1955	1.10986	.02825 ..	.844 ..	.329 ..	.267 ..	7.43
1956	1.10729	.02873 ..	.877 ..	.347 ..	.293 ..	7.26
1957	1.07867	.02799 ..	.574 ..	.310 ..	.246 ..	7.45
1958	1.09250	.02779 ..	.516 ..	.259 ..	.221 ..	8.21
1959	1.07932	.02812 ..	.611 ..	.257 ..	.242 ..	8.74
1960	1.09153	.02850 ..	.639 ..	.256 ..	.277 ..	7.32
1961	1.14008	.03012 ..	.620 ..	.243 ..	.258 ..	8.16
1962	1.20278	.03730 ..	.672 ..	.227 ..	.274 ..	8.19
1963	1.21371	.04436 ..	.676 ..	.265 ..	.290 ..	8.08
1964	1.21371	.04484 ..	.737 ..	.323 ..	.323 ..	7.65
1965	1.21307	.04481 ..	.846 ..	.380 ..	.345 ..	7.75
1966	1.21242	.04479 ..	1.176 ..	.359 ..	.344 ..	8.02
1967	1.21403	.05373 ..	1.125 ..	.333 ..	.329 ..	8.54
1968	1.21242	.07429 ..	1.195 ..	.321 ..	.312 ..	8.72
1969	1.21178	.06196 ..	1.470 ..	.354 ..	.347 ..	8.82

[1] *See* page 56 for detailed explanation.

Prices[1] Used in Valuing Production of Gold, Silver, Copper, Lead, Zinc, and Coal—Continued

Year	Gold, Fine	Silver, Fine	Copper	Lead	Zinc	Coal
	$/g	$/g	$/kg	$/kg	$/kg	$/t
1970	1.17545	.05946 U.S.	1.294[2] U.S.	.360 U.S.	.353 U.S.	8.16
1971	1.13622	.05014 "	1.030[2] "	.308 "	.359 "	11.06
1972	1.84934	.05348 "	.989[2] "	.328 "	.388 "	12.08
1973	3.13185	.08251 "	1.835[2] "	.359 "	.455 "	12.71
1974	5.34868[2]	.15653[2] "	1.884[2] "	.422[2] "	.767[2] "	19.93
1975	5.20466[2]	.15560[2] "	1.283[2] "	.346[2] "	.808[2] "	35.53
1976	4.03514[2]	.13571[2] "	1.438[2] "	.384[2] "	.615[2] "	39.63
1977	5.29972[2]	.15707[2] "	1.398[2] "	.541[2] "	.591[2] "	39.04
1978	7.32948[2]	.19832[2] "	1.577[2] "	.637[2] "	.544[2] "	40.35
1979	12.58090[2]	.44228[2] "	2.412[2] "	1.043[2] "	.700[2] "	41.56
1980	*22.776[2]*	*.76814[2]* "	*2.534[2]* "	*.862[2]* "	*.732[2]* "	*42.64*

[1] *See* page 56 for detailed explanation.
[2] *See* page 57 for explanation.

Table 3-1—Mineral Production: Total to Date, Past Year, and Latest Year

Products[1]		Total Quantity to Date[2]	Total Value to Date	Quantity, 1979	Value, 1979	Quantity, 1980	Value, 1980
Metals			$		$		$
Antimony	kg	27 395 414	28 656 478	177 046	916 081	78 654	416 080
Bismuth	kg	3 318 561	16 309 658	33 809	173 667	23 501	136 306
Cadmium	kg	20 814 041	88 968 410	239 096	1 417 506	92 360	560 679
Chromite	t	722	32 295				
Cobalt	kg	114 484	376 661				
Copper	kg	4 484 286 254	5 431 090 817	272 163 001	656 359 923	264 674 830	670 623 616
Gold							
placer	g	163 674 913	107 328 172	214 106	2 649 918	280 104	6 213 376
lode, fine	g	584 732 869	950 218 168	8 062 810	101 481 156	7 197 312	163 930 073
Iron concentrates	t	34 425 083	369 885 164	668 026	13 008 475	653 324	13 670 233
Lead	kg	7 997 094 241	1 770 759 536	84 451 905	88 100 363	76 709 447	66 096 223
Magnesium	kg	92 819	88 184				
Manganese	t	1 564	32 668				
Mercury	kg	6 094 387	49 218 263				
Molybdenum	kg	182 155 060	1 482 505 196	10 766 497	321 228 104	11 209 501	288 934 398
Nickel	kg	23 337 783	51 698 754				
Palladium	g	23 296	30 462				
Platinum	g	44 042	138 801	280	3 793		
Selenium	kg	332	1 389				
Silver	g	17 288 605 858	821 989 167	214 117 518	94 700 656	203 801 811	156 548 306
Tin	kg	9 799 103	31 601 432	240 984	3 818 948	139 517	2 438 881
Tungsten (WO_3)	kg	9 080 002	48 068 016				
Zinc	kg	7 578 097 715	1 979 626 928	88 418 642	61 890 891	67 481 328	49 363 417
Others			38 667 748		5 027 280		10 070 592
Totals			13 267 292 367		1 350 776 761		1 429 002 180
Industrial Minerals							
Arsenious oxide	kg	9 987 789	273 201				
Asbestos	t	1 703 489	609 185 903	94 286	65 520 069	100 089	81 688 936
Bentonite	t	718	16 858				
Fluxes	t	3 981 241	8 628 608	27 741	129 035	20 573	93 135
Granules	t	659 027	17 112 930	30 074	1 458 987	31 393	1 694 947
Gypsum and gypsite	t	8 989 192	39 794 644	718 557	3 782 628	751 067	5 387 949
Hydromagnesite	t	2 044	27 536				
Iron oxide and ochre	t	16 427	155 050				
Jade	kg	2 587 914	8 391 353	258 505	1 325 777	449 156	1 580 241
Magnesium sulphate	t	12 604	254 352				
Mica	kg	5 815 954	185 818				
Natro-alunite	t	474	9 398				
Perlite	t	1 009	11 120				
Phosphate rock	t	3 485	16 894				
Sodium carbonate	t	9 518	118 983				
Sulphur	t	9 435 400	158 126 649	383 724	9 616 390	359 413	21 712 359
Talc	t	984	34 871				
Others			15 773 458		1 268 098		3 768 440
Totals			858 117 626		83 100 984		115 926 007
Structural Materials							
Cement	t	21 513 944	643 651 156	1 336 080	80 052 461	1 351 320	90 881 086
Clay products			148 055 315		11 744 194		10 387 121
Lime and limestone	t		109 076 357	2 880 138	8 037 476	3 129 762	9 945 084
Rubble, rip-rap, crushed rock	t		136 341 804	2 488 389	6 766 665	7 019 167	32 436 456
Sand and gravel	t		760 527 662	46 241 983	71 918 633	45 278 202	98 666 100
Building stone	t	1 060 462	9 380 600	2 194	19 700	91	9 850
Not assigned			5 972 171				
Totals			1 813 005 065		178 539 129		242 325 657
Coal							
Coal—sold and used	t	211 656 939	3 217 995 995	10 570 370	439 280 152	10 823 530	461 492 857
Petroleum and Natural Gas							
Crude oil	m^3	52 478 846	1 493 826 378	2 139 963	168 928 671	2 002 128	184 347 641
Field condensate	m^3	288 086	13 535 029	32 549	2 569 418	36 855	3 605 414
Plant condensate	m^3	3 421 912	68 231 826	184 398	13 396 500	133 601	13 657 452
Natural gas to pipeline 10^3	m^3	146 002 546	2 996 037 625	11 392 641	699 508 127	8 931 833	546 911 784
Butane	m^3	1 747 898	35 180 788	112 683	7 122 711	89 556	7 350 486
Propane	m^3	1 383 739	26 393 217	84 864	4 851 698	75 507	5 190 597
Totals			4 633 204 863		896 377 125		761 063 374
Grand Totals			23 789 615 916		2 948 074 151		3 009 810 075

[1] *See* notes on individual products listed alphabetically on pages 59 to 68.

[2] *See* page 11 for conversion table to old system.

Table 3-2—Total Value of Mineral Production, 1836–80

Year	Metals	Industrial Minerals	Structural Materials	Coal	Petroleum and Natural Gas	Total
	$	$	$	$	$	$
1836–86	52 880 750		43 650	10 758 565		63 610 965
1887	729 381		22 168	1 240 080		1 991 629
1888	745 794		46 432	1 467 903		2 260 129
1889	685 512		77 517	1 739 490		2 502 519
1890	572 884		75 201	2 034 420		2 682 505
1891	447 136		79 475	3 087 291		3 613 902
1892	511 075		129 234	2 479 005		3 119 314
1893	659 969			2 934 882		3 594 851
1894	1 191 728			3 038 859		4 230 587
1895	2 834 629			2 824 687		5 659 316
1896	4 973 769		726 323	2 693 961		8 394 053
1897	7 575 262		150 000	2 734 522		10 459 784
1898	7 176 870		150 000	3 582 595		10 909 465
1899	8 107 509		200 000	4 126 830		12 434 312
1900	11 360 546		250 000	4 744 530		16 355 076
1901	14 258 455		400 000	5 016 398		19 674 853
1902	12 163 561		450 000	4 832 257		17 445 818
1903	12 640 083		525 000	4 332 297		17 497 380
1904	13 424 755	2 400	575 000	4 953 024		18 955 179
1905	16 289 165		660 800	5 511 861		22 461 826
1906	18 449 602		982 900	5 548 044		24 980 546
1907	17 101 305		1 149 400	7 637 713		25 888 418
1908	15 277 991		1 200 000	7 356 866		23 784 857
1909	14 668 141		1 270 559	8 574 884		24 513 584
1910	13 768 731		1 500 000	11 108 335		26 377 066
1911	11 880 062	46 345	3 500 917	8 071 747		23 499 071
1912	18 218 266	17 500	3 436 222	10 786 812		32 458 800
1913	17 701 432	46 446	3 249 605	9 107 460		30 194 943
1914	15 790 727	51 810	2 794 107	7 745 847		26 382 491
1915	20 765 212	133 114	1 509 235	7 114 178		29 521 739
1916	32 092 648	150 718	1 247 912	8 900 675		42 391 953
1917	27 299 934	174 107	1 097 900	8 484 343		37 056 284
1918	27 957 302	281 131	783 280	12 833 994		41 855 707
1919	20 058 217	289 426	980 790	11 975 671		33 304 104
1920	19 687 532	508 601	1 962 824	13 450 169		35 609 126
1921	13 160 417	330 503	1 808 392	12 836 013		28 135 325
1922	19 605 401	251 922	2 469 967	12 880 060		35 207 350
1923	25 769 215	140 409	2 742 388	12 678 548		41 330 560
1924	35 959 566	116 932	2 764 013	9 911 935		48 752 446
1925	46 480 742	101 319	2 766 838	12 168 905		61 517 804
1926	51 867 792	223 748	3 335 885	11 650 180		67 077 605
1927	45 134 289	437 729	2 879 160	12 269 135		60 720 313
1928	48 640 158	544 192	3 409 142	12 633 510		65 227 002
1929	52 805 345	807 502	3 820 732	11 256 260		68 689 839
1930	41 785 380	457 225	4 085 105	9 435 650		55 763 360
1931	23 530 469	480 319	3 538 519	7 684 155		35 233 462
1932	20 129 869	447 495	1 705 708	6 523 644		28 806 716
1933	25 777 723	460 683	1 025 586	5 375 171		32 639 163
1934	35 177 224	486 554	1 018 719	5 725 133		42 407 630
1935	42 006 618	543 583	1 238 718	5 048 864		48 837 783
1936	45 889 944	724 362	1 796 677	5 722 502		54 133 485
1937	65 224 245	976 171	2 098 339	6 139 920		74 438 675
1938	55 959 713	916 841	1 974 976	5 565 069		64 416 599
1939	56 216 049	1 381 720	1 832 464	6 280 956		65 711 189
1940	64 332 166	1 073 023	2 534 840	7 088 265		75 028 294
1941	68 807 630	1 253 561	2 845 262	7 660 000		77 566 453
1942	63 626 140	1 434 382	3 173 635	8 237 172		76 471 329
1943	55 005 394	1 378 337	3 025 255	7 742 030		67 151 016
1944	42 095 013	1 419 248	3 010 088	8 217 966		54 742 315
1945	50 673 592	1 497 720	3 401 229	6 454 360		62 026 901
1946	58 834 747	1 783 010	5 199 563	6 732 470		72 549 790
1947	95 729 867	2 275 972	5 896 803	8 680 440		112 583 082
1948	124 091 753	2 358 877	8 968 222	9 765 395		145 184 247
1949	110 219 917	2 500 799	9 955 790	10 549 924		133 226 430
1950	117 166 836	2 462 340	10 246 939	10 119 303		139 995 418

Table 3-2—Total Value of Mineral Production, 1836–1980—Continued

Year	Metals	Industrial Minerals	Structural Materials	Coal	Petroleum and Natural Gas	Total
	$	$	$	$	$	$
1951	153 598 411	2 493 840	10 606 048	10 169 617		176 867 916
1952	147 857 523	2 181 464	11 596 961	9 729 739		171 365 687
1953	126 755 705	3 002 673	13 555 038	9 528 279		152 841 695
1954	123 834 286	5 504 114	14 395 174	9 154 544	6 545	152 894 663
1955	142 609 505	6 939 490	15 299 254	8 986 501	18 610	173 853 360
1956	149 441 246	9 172 792	20 883 631	9 346 518	319 465	189 163 652
1957	125 353 920	11 474 050	25 626 939	7 340 339	1 197 581	170 992 829
1958	104 251 112	9 958 768	19 999 576	5 937 860	4 806 233	144 953 549
1959	105 076 530	12 110 286	19 025 209	5 472 064	5 967 128	147 651 217
1960	130 304 373	13 762 102	18 829 989	5 242 223	9 226 646	177 365 333
1961	128 565 774	12 948 308	19 878 921	6 802 134	11 612 184	179 807 321
1962	159 627 293	14 304 214	21 366 265	6 133 986	27 939 726	229 371 484
1963	172 852 866	16 510 898	23 882 190	6 237 997	36 379 636	255 863 587
1964	180 926 329	16 989 469	26 428 939	6 327 678	36 466 753	267 139 168
1965	177 101 733	20 409 649	32 325 714	6 713 590	44 101 662	280 652 348
1966	208 664 003	22 865 324	43 780 272	6 196 219	54 274 187	335 780 005
1967	235 865 318	29 364 065	44 011 488	7 045 341	67 096 286	383 382 498
1968	250 912 026	26 056 782	45 189 476	7 588 989	75 281 215	405 028 488
1969	294 881 114	20 492 943	55 441 528	6 817 155	86 756 009	464 388 749
1970	309 981 470	22 020 359	46 104 071	19 559 669	90 974 467	488 640 036
1971	301 059 951	21 909 767	59 940 333	45 801 936	99 251 158	527 963 145
1972	372 032 770	25 764 120	66 745 698	66 030 210	105 644 978	636 217 776
1973	795 617 596	27 969 664	73 720 831	87 976 105	124 104 445	1 109 388 641
1974	764 599 451	33 676 214	78 088 393	154 593 643	233 275 505	1 264 233 206
1975	586 650 344	48 667 602	90 928 011	317 111 744	320 719 474	1 364 077 175
1976	646 750 403	52 917 142	100 938 648	298 683 679	420 973 564	1 520 263 436
1977	714 036 707	79 185 099	115 650 992	328 846 883	550 439 856	1 788 159 537
1978	819 778 518	59 471 361	142 105 285	381 895 241	568 931 051	1 972 181 456
1979	1 350 776 761	83 100 984	178 539 129	439 280 152	896 377 125	2 948 074 151
1980	1 429 002 180	115 926 007	242 325 657	461 492 857	761 063 374	3 009 810 075
Totals	13 267 292 367	858 117 626	1 813 005 065	3 217 995 995	4 633 204 863	23 789 615 916

Table 3-3—Mineral Production for the 10 Years, 1971–1980

Description	1971		1972		1973		1974		1975	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Metals		$		$		$		$		$
Antimony kg	146 748	243 614	308 260	419 042	753 110	1 192 118	221 238	879 897	364 045	1 467 928
Bismuth kg	37 431	388 674	42 556	324 617	1 293	13 058	33 711	680 771	19 163	261 931
Cadmium kg	470 243	2 011 223	315 540	1 759 995	367 761	2 951 236	195 979	1 532 096	320 923	1 971 035
Cobalt kg	51 503	103 099	70 642	155 739	18 555	117 403				
Copper kg	127 286 040	131 037 918	211 832 288	209 403 822	317 603 055	582 803 251	287 547 048	541 644 913	258 497 599	331 693 850
Gold—placer g	5 505	4 647	21 492	26 905	119 156	211 524	45 162	232 512	43 744	232 204
lode, fine g	2 668 046	3 031 844	3 782 871	6 995 448	5 784 723	18 117 268	5 001 082	26 749 083	4 819 241	25 082 494
Iron concentrates t	1 750 738	18 153 612	1 139 698	11 642 379	1 420 160	12 906 063	1 306 930	12 742 227	1 305 840	15 273 878
Lead kg	112 865 575	34 711 408	88 109 663	28 896 566	84 890 924	30 477 936	55 252 692	23 333 016	70 603 483	24 450 158
Molybdenum kg	9 926 694	36 954 846	12 719 391	43 260 349	13 785 264	51 851 509	13 789 825	60 791 552	13 026 627	71 201 391
Nickel kg	1 153 742	3 497 420	1 469 851	4 601 486	1 119 221	3 775 232	688 656	2 351 406		
Silver g	238 670 301	11 968 046	215 420 498	11 519 660	236 987 318	19 552 997	181 695 950	28 440 365	196 305 885	30 545 947
Tin kg	144 695	421 079	159 230	473 908	138 221	597 265	143 816	1 150 722	32 511	200 669
Tungsten (WO_3) kg	605 909	3 012 540	577 509	2 167 663	640 378	4 224 062				
Zinc kg	138 549 629	49 745 789	121 719 968	47 172 894	137 380 768	62 564 751	77 733 732	59 582 753	99 668 230	80 572 872
Others		5 774 192		3 212 297		4 161 923		4 488 138		3 695 987
Subtotals		301 059 951		372 032 770		795 617 596		764 599 451		586 650 344
Industrial Minerals										
Asbestos t	79 032	17 800 406	95 986	20 870 241	98 852	21 102 892	83 403	27 398 900	76 771	37 849 743
Diatomite t	1 406	37 830	1 338	52 073	513	9 526	1 593	32 600	5 847	229 483
Fluxes (quartz, limestone) t	24 258	98 426	28 667	59 246	41 937	106 371	34 451	206 049	35 914	174 824
Granules (quartz, limestone, granite) t	26 524	519 192	33 709	757 924	31 135	857 643	31 546	1 025 615	37 316	1 144 968
Gypsum and gypsite t	312 791	930 348	352 272	1 087 196	331 347	1 114 009	400 338	1 412 157	474 387	1 751 799
Jade kg	76 094	196 332	110 551	235 218	69 967	306 808	3 510	18 613	110 437	414 123
Sulphur t	261 691	2 147 778	270 074	2 306 933	286 701	4 187 387	206 646	3 068 507	246 079	5 738 134
Others		179 455		395 289		285 028		513 773		1 364 528
Subtotals		21 909 767		25 764 120		27 969 664		33 676 214		48 667 602
Structural Materials										
Cement t	822 329	21 629 385	808 230	21 014 112	862 521	24 935 624	890 372	25 828 823	915 293	31 661 722
Clay products		5 981 785		5 263 749		5 590 290		6 615 128		6 593 189
Lime and limestone t	1 650 658	3 037 222	1 838 227	3 357 927	1 954 008	3 633 870	2 097 909	4 297 547	1 976 415	4 349 800
Rubble, riprap, and crushed rock t	3 327 758	3 670 583	3 013 438	4 032 548	2 579 122	4 160 009	2 691 473	5 715 219	4 103 452	8 723 448
Sand and gravel t	26 598 612	25 612 396	31 593 921	33 076 196	30 811 402	35 379 540	31 440 908	35 611 346	28 945 523	39 575 457
Building-stone t	2 057	8 962	176	1 166	729	21 448	452	20 330	53	4 395
Subtotals		59 940 333		66 745 698		73 720 831		78 088 393		90 928 011
Coal										
Sold and used t	4 141 496	45 801 936	5 466 846	66 030 210	6 924 733	87 976 105	7 757 440	154 593 643	8 924 816	317 111 744
Total solid minerals		428 711 987		530 572 798		985 284 196		1 030 957 701		1 043 357 701
Petroleum and Natural Gas										
Crude oil m^3	3 999 185	66 471 856	3 788 849	63 166 717	3 368 902	68 306 032	3 012 501	103 335 328	2 269 898	94 229 725
Field condensate m^3	17 331	287 781	16 619	277 069	20 114	407 817	16 561	568 075	16 094	668 092
Plant condensate m^3	177 137	293 287	161 854	327 820	180 088	222 463	178 534	924 549	185 272	6 525 837
Natural gas delivered to pipeline 10^3m^3	7 685 055	31 946 372	9 939 498	41 616 824	10 789 269	54 762 105	9 016 996	128 018 726	9 236 489	214 733 528
Butane m^3	50 590	101 822	54 200	106 533	109 057	212 640	105 426	232 085	106 427	2 577 205
Propane m^3	74 547	150 040	76 323	150 015	99 188	193 398	89 373	196 742	81 975	1 985 087
Total petroleum and natural gas		99 251 158		105 644 978		124 104 445		233 275 505		320 719 474
Grand totals		527 963 145		636 217 776		1 109 388 641		1 264 233 206		1 364 077 175

Table 3-3—Mineral Production for the 10 Years, 1971–1980—Continued

Description	1976		1977		1978		1979		1980	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		$		$		$		$		$
Metals										
Antimony kg	447 001	1 630 871	946 207	2 519 730	490 521	2 083 895	177 026	906 083	78 654	416 080
Bismuth kg	20 261	226 462	18 581	187 612	29 172	166 452	33 859	173 667	23 501	136 306
Cadmium kg	956 422	1 530 880	830 711	1 720 050	253 803	1 186 320	230 046	1 417 506	92 360	560 679
Cobalt kg										
Copper kg	263 618 197	378 984 941	275 224 115	384 736 661	273 692 676	431 693 396	272 163 401	686 399 923	264 674 830	670 623 616
Gold—placer g	26 064	115 613	46 170	289 075	36 515	295 881	214 106	2 629 918	280 104	6 213 376
lode, fine g	5 893 477	21 761 502	5 906 336	31 301 931	6 542 332	47 951 660	8 662 810	101 481 156	7 197 312	163 930 073
Iron concentrates t	1 255 277	14 760 526	445 317	7 362 345	615 566	11 597 462	668 026	13 088 475	653 324	13 670 233
Lead kg	85 407 582	52 796 533	78 172 646	42 316 293	81 063 530	51 620 564	84 451 905	88 100 363	76 709 447	86 096 223
Molybdenum kg	14 008 686	94 109 138	15 521 970	142 057 947	13 055 203	167 714 272	10 766 497	321 228 104	11 209 501	288 934 398
Platinum g							280	1 793		
Silver g	239 720 802	32 532 836	241 503 107	37 934 098	227 271 980	45 071 589	234 217 519	92 780 656	207 801 811	156 548 306
Tin kg	102 262	712 912	187 478	1 912 300	261 863	3 675 508	240 964	5 818 928	139 517	2 438 981
Tungsten (WO_3) kg										
Zinc kg	106 498 987	65 499 108	103 780 228	61 301 401	95 618 111	52 048 701	88 418 642	61 980 891	67 481 328	49 363 417
Others		2 083 161		397 654		4 652 559		5 027 280		10 070 592
Subtotals		646 750 403		714 036 707		819 778 518		1 350 776 761		1 429 002 180
Industrial Minerals										
Asbestos t	90 443	40 727 296	97 033	69 729 205	68 266	47 096 170	92 296	65 520 099	100 089	81 688 936
Diatomite t	2 737	182 159	1 239	49 595	2 184	90 326	1 452	33 025	1 615	138 273
Fluxes (quartz, limestone) t	11 378	33 263	28 624	95 261	22 475	56 894	27 741	129 035	43 986	93 135
Granules (quartz, limestone, granite) t	31 476	1 219 884	29 951	1 288 289	26 849	1 196 160	30 074	1 458 967	31 393	1 694 947
Gypsum and gypsite t	556 134	4 434 471	653 126	2 357 488	713 080	3 110 695	718 557	3 762 628	751 067	5 367 949
Jade kg	483 766	1 535 030	266 621	825 523	408 759	1 422 018	258 505	1 325 777	439 156	1 580 241
Sulphur t	231 704	4 296 189	248 892	3 871 660	322 161	5 647 993	383 724	9 616 360	359 413	21 712 359
Others		488 850		1 017 682		922 095		1 235 071		3 630 167
Subtotals		52 917 142		79 185 099		59 471 361		83 100 984		115 926 007
Structural Materials										
Cement t	836 506	34 973 746	989 522	42 705 320	1 020 064	56 140 564	1 136 080	80 052 461	1 161 320	90 882 086
Clay products		6 995 917		4 980 799		6 262 560		11 744 192		10 387 121
Lime and limestone t	2 173 831	5 610 063	2 231 166	5 861 614	2 512 867	6 929 484	2 880 138	8 037 476	3 129 762	9 945 044
Rubble, riprap, and crushed rock t	2 485 215	5 205 973	2 864 503	7 309 536	2 821 920	8 410 065	2 498 389	6 766 665	2 019 167	32 436 456
Sand and gravel	36 073 618	48 138 635	53 982 528	54 809 121	38 353 326	64 324 582	46 241 983	71 918 633	45 278 202	98 666 109
Building-stone	657	14 314	4 535	55 602	405	18 030	2 198	19 709	93	9 850
Subtotals		100 938 648		115 650 992		142 105 285		178 539 129		242 325 657
Coal										
Sold and used t	7 537 695	298 683 679	8 424 181	328 846 883	9 463 920	381 895 241	10 570 370	439 280 152	10 823 530	491 492 857
Total solid minerals		1 099 289 872		1 237 719 681		1 403 250 405		2 051 697 026		2 248 746 701
Petroleum and Natural Gas										
Crude oil m^3	2 867 450	116 595 050	2 200 303	102 850 095	2 088 660	129 095 524	2 139 983	108 928 671	2 092 129	184 347 641
Field condensate m^3	18 309	901 711	24 865	1 877 248	25 366	1 976 217	32 530	2 569 439	36 895	4 605 414
Plant condensate m^3	167 576	7 198 957	180 267	9 751 058	155 503	10 269 961	184 398	13 396 580	133 601	13 657 452
Natural gas delivered to pipeline 10^3m^3	8 709 508	267 997 050	8 895 663	396 601 354	8 083 029	401 373 236	11 342 641	669 508 127	8 931 833	546 911 768
Butane m^3	109 701	4 561 832	111 347	5 358 167	106 580	5 932 766	112 663	7 122 711	84 556	7 350 486
Propane m^3	88 195	4 008 955	91 297	4 992 988	85 712	4 513 447	82 864	4 851 606	78 567	4 100 547
Total petroleum and natural gas		420 973 563		591 430 856		568 931 051		806 477 125		761 063 374
Grand totals		1 520 263 436		1 829 150 537		1 972 181 456		2 858 174 151		3 009 810 075

Table 3-4—Comparison of Total Quality and Value of Production, and Quantity and Value of Production Paid for to Mines

Metals	Units	1980 Total Production		1980 Production Paid for to Mines	
		Quantity	Value	Quantity	Value
			$		$
Antimony	kg	78 654	416 080	.....	.....
Bismuth	kg	23 501	136 306	.....	.....
Cadmium	kg	92 360	560 679	24 867	135 097
Copper	kg	264 674 830	670 623 616	264 215 775	560 404 822
Gold—placer	g	280 104	6 213 376	280 104	6 213 376
Gold—lode, fine	g	7 197 312	163 930 073	7 106 785	137 295 564
Iron concentrates	t	653 324	13 670 233	653 324	13 670 233
Lead	kg	76 709 447	66 096 223	72 406 603	53 770 955
Molybdenum	kg	11 209 501	288 934 398	11 209 501	288 934 398
Silver	g	203 801 811	156 548 306	182 037 238	118 981 471
Tin	kg	139 517	2 438 881	108 035	1 829 320
Zinc	kg	67 481 328	49 363 417	58 509 028	36 298 798
Others	.....	.....	10 070 592	.....	5 209 141
Totals	.....	.....	1 429 002 186	.....	1 222 743 175

NOTE: For metals, the total quantity and value of production include the quantities paid for to the mines, and the smelter and refining production that can be attributed to the mines but is not paid for. The quantity and value paid for to the mines, excluding outward transportation costs, smelting and refining costs, penalties and deductions, are shown separately for comparative purposes.

Table 3-5—Exploration and Development Expenditures, 1974—1980

	Physical Work and Surveys	Administration, Overhead, Land Costs, Etc.	Construction, Machinery and Equipment, Other Capital Costs	Totals
A. Exploration on Undeclared Mines	$	$	$	$
Metal mines—				
1974	18 773 326	6 525 878	128 144	25 427 348
1975	16 366 152	5 298 367	442 327	22 106 846
1976	20 437 180	6 365 331	381 416	27 183 927
1977	19 097 099	6 974 231	106 059	26 177 389
1978	22 724 774	5 715 214	1 035 353	29 475 341
1979	42 789 552	10 438 163	583 114	53 810 829
1980	74 378 109	14 367 266	4 107 339	92 852 714
Coal mines—				
1974	3 450 746	884 849	18 958	4 354 553
1975	9 955 507	3 057 843	.....	13 013 350
1976	9 234 269	3 678 893	.....	12 913 162
1977	14 741 425	4 797 788	.....	19 539 213
1978	15 289 351	4 511 572	.....	19 800 923
1979	11 765 168	6 073 861	.....	17 839 029
1980	9 830 425	5 703 387	.....	15 533 812
Others—				
1974	42 706	11 134	.....	53 840
1975	90 025	35 679	.....	125 704
1976	73 453	47 760	.....	121 213
1977	327 113	9 860	222 092	559 065
1978	342 100	117 180	.....	459 280
1979	135 062	149 131	.....	284 193
1980	1 340 398	189 292	.....	1 529 690
Totals —				
1974	22 266 778	7 421 861	147 102	29 835 741
1975	26 411 684	8 391 889	442 327	35 245 900
1976	29 744 902	10 091 984	381 416	40 218 302
1977	34 165 637	11 781 879	328 151	46 275 667
1978	38 356 225	10 343 966	1 035 353	49 735 544
1979	54 689 782	16 661 155	583 114	71 934 051
1980	85 548 932	20 259 945	4 107 339	109 916 216
B. Exploration on Declared or Operating Mines				
Metal mines—				
1974	2 652 243	762 224	278 500	3 692 967
1975	2 792 378	3 090 135	.....	5 882 513
1976	8 359 413	83 304	.....	8 442 717
1977	2 988 366	2 020 259	.....	5 008 625
1978	6 562 912	1 729 402	.....	8 292 314
1979	6 946 143	1 585 176	263 586	8 794 905
1980	26 712 536	4 345 682	2 551 716	33 609 934
Coal mines—				
1974	488 308	104 259	.....	592 567
1975	1 000 000	.....	.....	1 000 000
1976	665 000	28 000	.....	693 000
1977	5 978 043	25 115 000	.....	31 093 043
1978	4 052 774	510 612	.....	4 563 386
1979	3 376 551	398 984	.....	3 775 535
1980	12 504 905	8 510 426	.....	21 015 331

Table 3-5—Exploration and Development Expenditures, 1974—1980—Continued

	Physical Work and Surveys	Administration, Overhead, Land Costs, Etc.	Construction, Machinery and Equipment, Other Capital Costs	Totals
B. Exploration on Declared or Operating Mines—Continued	$	$	$	$
Others—				
1974	4 236	.....	.....	4 236
1975	36 242	2 700	.....	38 942
1976	214 081	30 000	.....	244 081
1977	106 896	403 000	.....	510 196
1978	12 025	.....	36 604	48 629
1979	35 200	.....	1 300	36 500
1980	187 332	.....	.....	187 332
Totals—				
1974	3 144 787	866 483	278 500	4 289 770
1975	3 828 620	3 092 835	.....	6 921 455
1976	9 238 494	141 304	.....	9 379 798
1977	9 073 305	27 538 559	.....	36 611 864
1978	10 693 030	2 240 014	.....	12 867 725
1979	10 357 894	1 984 160	264 886	12 606 940
1980	39 404 773	12 856 108	2 551 716	54 812 597
C. Development on Declared Mines				
Metal mines—				
1974	1 280 513	1 028 199	1 985 000	4 293 712
1975	.....	57 166	840 344	897 510
1976	512 197	974 985	12 447 569	13 934 751
1977	380 419	1 132 316	33 672 153	35 184 888
1978	133 335	895 892	.....	1 029 227
1979	3 482 962	1 351 567	54 559 204	59 393 733
1980	83 119 989	736 527	23 446 243	107 302 759
Coal mines—				
1974	320 098	256 055	111 500	687 653
1975	.....	.....	.....	.....
1976	1 425 312	583 304	.....	2 008 615
1977	1 725 484	247 313	.....	1 972 797
1978	30 957	38 910	.....	69 867
1979	981 517	350 157	.....	1 331 674
1980	3 296 000	69 000	43 280 261	46 645 261
Others—				
1974	23 242	37 988	2 883 584	2 944 814
1975	.....	.....	.....	.....
1976	.....	3 155	18 001 500	18 004 655
1977	64 689	708	40 000	105 397
1978	7 045	2 159	10 000	19 204
1979	.....	.....	.....	.....
1980	.....	.....	.....	.....
Totals—				
1974	1 623 853	1 322 242	4 980 084	7 926 179
1975	.....	57 166	840 344	897 510
1976	1 937 509	1 561 444	30 449 069	33 948 022
1977	2 170 592	1 380 337	33 712 153	37 263 082
1978	171 337	936 961	10 000	1 118 298
1979	4 464 479	1 701 724	54 559 204	60 725 407
1980	86 415 989	805 527	66 726 504	153 948 020
D. Development on Operating Mines				
Metal mines—				
1974	20 933 501	1 722 680	46 732 326	69 388 507
1975	9 013 375	5 804 924	24 548 602	39 366 901
1976	6 937 229	404 226	41 881 126	49 222 581
1977	14 491 378	1 722 479	45 859 006	62 072 863
1978	10 424 872	575 164	17 908 816	28 908 852
1979	27 395 046	2 672 011	67 831 381	97 898 438
1980	33 379 015	2 541 622	250 726 066	286 646 703
Coal mines—				
1974	9 027 818	.....	16 607 506	25 635 324
1975	3 300 000	.....	59 000 000	62 300 000
1976	16 043 383	55 377	20 767 397	36 866 157
1977	30 466 894	.....	25 943 377	56 410 271
1978	31 222 528	.....	15 621 757	46 844 285
1979	46 473 678	628 021	40 698 097	87 799 796
1980	63 173 491	762 244	68 817 158	132 752 893
Others—				
1974	6 198 552	146 182	16 606 229	22 950 963
1975	17 350 175	124 860	18 077 384	35 552 419
1976	58 980	79 300	1 389 956	1 528 236
1977	432 731	108 500	931 521	1 472 752
1978	102 248	9 579	1 220 265	1 332 092
1979	187 044	30 700	1 033 645	1 251 389
1980	1 139 216	3 461	2 889 032	4 031 709
Totals—				
1974	36 159 871	1 868 862	79 946 061	117 974 794
1975	29 663 550	5 929 784	101 625 986	137 219 320
1976	23 039 592	538 903	64 038 479	87 616 974
1977	45 391 003	1 830 979	72 733 904	119 955 886
1978	41 749 648	584 743	35 076 931	77 121 833
1979	74 055 768	3 330 732	109 563 123	186 949 623
1980	97 691 722	3 307 327	322 432 256	423 431 305

Table 3-6—Production of Gold, Silver, Copper, Lead, Zinc, Molybdenum, and Iron Concentrates, 1858–1980

Year	Gold (Placer)		Gold (Fine)		Silver		Copper	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	g	$	g	$	g	$	kg	$
1858–90	100 978 533	55 192 163			6 876 531	214 152		
1891–1900	11 703 748	6 397 183	19 682 165	12 858 353	700 977 829	13 561 194	16 064 375	4 365 210
1901–1910	15 787 261	8 628 660	72 224 836	47 998 179	971 114 910	16 953 507	172 344 737	56 384 783
1911	779 441	426 000	7 110 675	4 725 512	58 858 198	958 293	16 750 016	4 571 644
1912	1 016 446	555 500	8 008 898	5 322 442	95 417 955	1 810 045	23 340 171	8 408 513
1913	933 090	510 000	8 467 916	5 627 595	107 798 519	1 968 606	21 073 930	7 094 489
1914	1 033 864	565 000	7 687 729	5 109 008	112 038 605	1 876 736	20 415 949	6 121 319
1915	1 408 655	770 000	7 776 403	5 167 934	104 708 436	1 588 991	25 817 619	9 835 500
1916	1 062 167	580 500	6 902 751	4 587 333	102 699 711	2 059 739	29 655 426	17 784 494
1917	907 585	496 000	3 562 009	2 367 191	91 107 405	2 265 749	26 765 241	16 038 256
1918	585 358	320 000	5 121 855	3 403 811	108 803 644	3 215 870	27 888 416	15 143 449
1919	524 086	286 500	4 740 906	3 150 644	105 847 210	3 592 673	19 259 132	7 939 896
1920	405 583	221 600	3 733 853	2 481 392	105 061 237	3 235 980	20 360 601	7 832 899
1921	426 733	233 200	4 222 699	2 804 197	83 150 418	1 591 201	17 706 790	4 879 624
1922	674 624	368 800	6 153 915	4 089 684	220 872 076	4 554 781	14 678 125	4 329 754
1923	768 555	420 000	5 575 057	3 704 994	187 643 964	3 718 129	26 181 346	8 323 266
1924	769 799	420 750	7 704 711	5 120 535	259 454 010	5 292 184	29 413 222	8 442 870
1925	512 453	280 092	6 522 890	4 335 069	238 088 613	5 286 818	32 797 475	10 153 269
1926	650 426	255 503	6 264 984	4 163 859	334 312 337	6 675 606	40 523 625	12 324 421
1927	285 868	156 247	5 536 365	3 679 601	325 654 164	5 902 043	40 461 530	11 525 011
1928	262 012	143 208	5 619 130	3 734 609	330 536 775	6 182 461	44 410 233	14 265 242
1929	217 192	118 711	4 516 871	3 002 020	309 791 230	5 278 194	46 626 180	18 612 850
1930	278 527	152 235	5 002 482	3 324 975	352 342 964	4 322 185	41 894 588	11 990 466
1931	534 225	291 992	4 545 175	3 020 837	234 837 945	2 254 979	29 090 879	5 365 690
1932	634 501	395 542	5 649 891	4 263 389	222 406 822	2 264 729	22 955 299	3 228 892
1933	744 233	562 787	6 954 289	6 394 645	218 397 615	2 656 526	19 572 164	3 216 701
1934	783 205	714 431	9 244 309	10 253 952	267 920 527	4 088 280	22 521 530	3 683 662
1035	961 985	895 038	11 363 263	12 856 419	288 323 068	6 005 996	17 884 241	3 073 428
1936	1 349 528	1 249 940	12 583 590	14 172 367	296 944 198	4 308 330	9 830 071	2 053 828
1937	1 684 321	1 558 245	14 331 671	16 122 767	351 630 830	5 073 962	20 891 260	6 023 411
1938	1 796 478	1 671 015	17 340 607	19 613 624	337 827 661	4 722 288	29 832 572	6 558 575
1939	1 547 250	1 478 492	18 267 912	21 226 957	336 577 786	4 381 365	33 227 590	7 392 862
1940	1 215 101	1 236 928	18 149 347	22 461 516	383 436 042	4 715 315	35 371 049	7 865 085
1941	1 361 534	1 385 962	17 760 622	21 984 501	378 700 797	4 658 545	30 134 516	6 700 693
1942	1 023 413	1 041 772	13 825 843	17 113 943	301 011 133	4 080 775	22 723 823	5 052 856
1943	454 104	462 270	6 979 607	8 639 516	265 193 820	3 858 496	19 190 263	4 971 132
1944	355 601	361 977	5 804 815	7 185 332	177 453 003	2 453 293	16 465 584	4 356 070
1945	391 556	398 591	5 454 626	6 751 860	191 510 720	2 893 934	11 726 375	3 244 472
1946	489 219	475 361	3 658 086	4 322 241	197 994 264	5 324 959	7 938 069	2 240 070
1947	216 757	200 585	7 566 800	8 514 870	177 550 262	4 110 092	18 952 769	8 519 741
1948	632 386	585 200	8 902 612	10 018 050	209 016 328	5 040 101	19 515 886	9 616 174
1949	556 308	529 524	8 969 981	10 382 256	237 559 178	5 671 082	24 882 500	10 956 550
1950	595 125	598 717	8 832 723	10 805 553	295 722 610	7 667 950	19 147 001	9 889 458
1951	736 861	717 911	8 126 405	9 627 947	255 632 882	7 770 983	19 617 612	11 980 155
1952	545 982	494 756	7 955 805	8 765 889	274 042 530	7 326 803	19 053 280	13 054 893
1953	443 062	403 230	7 886 228	8 727 294	260 606 407	7 019 272	22 235 441	14 869 544
1954	270 098	238 967	8 036 642	8 803 279	305 630 613	8 154 145	22 747 578	14 599 693
1955	238 436	217 614	7 541 762	8 370 306	245 811 643	6 942 995	20 065 928	16 932 549
1956	120 213	109 450	5 963 782	6 603 628	261 423 017	7 511 866	19 667 923	17 251 872
1957	91 318	80 990	6 948 504	7 495 170	252 847 111	7 077 166	14 237 029	8 170 465
1958	175 732	157 871	6 044 992	6 604 149	218 998 027	6 086 854	5 741 837	2 964 529
1959	235 450	208 973	5 385 360	5 812 511	192 779 535	5 421 417	7 363 374	4 497 991
1960	119 653	107 418	6 394 155	6 979 441	231 612 937	6 600 183	14 997 694	9 583 724
1961	106 248	99 884	4 970 913	5 667 253	229 353 429	6 909 140	14 375 361	8 965 149
1962	103 106	96 697	4 940 712	5 942 101	192 521 474	7 181 907	49 431 850	33 209 215
1963	143 696	135 411	4 820 312	5 850 458	199 764 616	8 861 050	53 635 704	36 238 007
1964	57 292	55 191	4 307 361	5 227 884	163 901 675	7 348 938	52 414 456	38 609 136
1965	26 935	25 053	3 642 908	4 419 089	154 646 729	6 929 793	38 644 540	32 696 081
1966	47 743	44 632	3 717 057	4 506 646	172 594 622	7 729 939	47 990 080	56 438 255
1967	27 713	25 632	3 923 861	8 763 688	192 239 525	10 328 695	78 352 932	88 135 172
1968	20 839	19 571	3 853 537	4 672 242	221 791 325	16 475 795	73 024 968	87 284 148
1969	12 410	11 720	3 654 012	4 427 506	179 169 889	11 100 491	75 937 956	111 592 416
1970	15 272	14 185	3 135 462	3 685 476	202 521 462	12 041 181	96 329 694	124 657 958
1971	5 505	4 647	3 668 046	3 031 844	238 670 301	11 968 046	127 286 040	131 037 918
1972	21 492	26 905	3 782 871	6 995 448	215 420 498	11 519 660	211 832 288	209 403 822
1973	119 156	311 524	5 784 723	18 117 268	236 987 318	19 552 997	317 603 055	582 807 251
1974	45 162	232 512	5 001 082	26 749 083	181 695 950	28 440 365	287 547 048	541 644 913
1975	43 744	232 204	4 819 241	25 082 494	196 305 885	30 545 947	258 497 599	331 693 850
1976	26 064	115 613	5 393 477	21 761 502	239 720 882	32 532 836	263 618 197	378 984 941
1977	46 170	289 075	5 906 336	31 301 931	241 503 007	37 934 098	275 224 115	384 736 661
1978	36 515	295 001	6 542 332	47 951 880	227 271 890	45 071 509	273 692 676	431 694 395
1979	214 106	2 649 918	8 062 810	101 481 156	214 117 518	94 700 656	272 163 001	656 359 923
1980	280 104	6 213 376	7 197 312	163 930 073	203 801 811	156 548 306	264 674 830	670 623 616
Totals	163 674 913	107 328 172	584 732 869	950 218 168	17 288 605 858	821 989 167	4 484 286 254	5 431 090 817

Table 3-6—Production of Gold, Silver, Copper, Lead, Zinc, Molybdenum, and Iron Concentrates, 1858–1980—Continued

Year	Lead		Zinc		Molybdenum		Iron Concentrates	
	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
	kg	$	kg	$	kg	$	t	$
1858–90	473 729	45 527	.....	.....	.....	.....	27 097	70 879
1891–1900	93 002 804	7 581 619	.....	.....	.....	.....	11 820	45 602
1901–1910	184 989 089	17 033 102	5 753 423	894 169	.....	.....	17 738	68 436
1911	12 189 051	1 069 521	1 195 003	129 092	.....	.....	.....	.....
1912	20 353 243	1 805 627	2 430 462	316 139	.....	.....	.....	.....
1913	25 112 864	2 175 832	3 065 710	324 421	.....	.....	.....	.....
1914	22 963 016	1 771 877	3 568 151	346 125	901	662	.....	.....
1915	21 093 563	1 939 200	5 888 705	1 460 524	1 641	2 000	.....	.....
1916	22 102 314	3 007 462	16 859 478	4 043 985	5 598	20 560	.....	.....
1917	16 922 293	2 951 020	18 982 067	3 166 259	3 371	11 636	.....	.....
1918	19 912 447	2 928 107	18 947 777	2 899 040	435	1 840	907	5 000
1919	13 370 004	1 526 855	25 735 631	3 540 429	.....	.....	1 116	6 150
1920	17 840 247	2 816 115	21 413 198	3 077 979	.....	.....	1 335	7 360
1921	18 779 664	1 693 354	22 416 133	1 952 065	.....	.....	916	5 050
1922	30 593 731	3 480 306	25 921 103	2 777 322	.....	.....	1 089	3 600
1923	43 845 439	6 321 770	26 464 465	3 278 903	.....	.....	220	1 337
1924	77 284 697	12 415 917	35 893 017	4 266 741	.....	.....	.....	.....
1925	107 908 698	18 670 329	44 568 438	7 754 450	.....	.....	.....	.....
1926	119 305 027	17 787 535	64 807 554	10 586 610	.....	.....	.....	.....
1927	128 364 347	14 874 292	65 872 809	8 996 135	.....	.....	.....	.....
1928	138 408 812	13 961 412	82 445 946	9 984 613	.....	.....	18	.....
1929	139 705 336	15 555 189	78 061 406	9 268 792	.....	.....	.....	.....
1930	145 966 952	12 638 198	113 614 910	9 017 005	.....	.....	.....	.....
1931	118 796 232	7 097 812	91 657 703	5 160 911	.....	.....	.....	.....
1932	114 308 115	5 326 432	87 143 752	4 621 641	.....	.....	.....	.....
1933	123 235 512	6 497 719	88 887 198	6 291 416	.....	.....	.....	.....
1934	157 562 183	8 461 859	113 013 038	7 584 199	.....	.....	.....	.....
1935	156 156 723	10 785 930	116 227 650	7 940 860	.....	.....	.....	.....
1936	171 444 146	14 790 028	115 475 574	8 439 373	.....	.....	.....	.....
1937	190 107 902	21 417 049	132 081 905	14 274 245	.....	.....	.....	.....
1938	187 323 227	13 810 024	135 395 388	9 172 822	.....	.....	.....	.....
1939	171 794 338	12 002 390	126 283 585	8 544 375	.....	.....	.....	.....
1940	211 758 089	15 695 467	141 529 456	10 643 026	.....	.....	.....	.....
1941	207 218 262	15 358 976	166 861 962	12 548 031	.....	.....	.....	.....
1942	230 060 714	17 052 054	175 646 590	13 208 636	.....	.....	.....	.....
1943	199 196 604	16 485 902	152 474 485	13 446 018	.....	.....	.....	.....
1944	132 866 893	13 181 530	126 126 765	11 956 725	.....	.....	.....	.....
1945	152 849 156	16 848 823	133 714 538	18 984 581	.....	.....	.....	.....
1946	156 879 853	23 345 731	124 406 109	21 420 484	.....	.....	.....	.....
1947	142 306 192	42 887 313	114 761 068	28 412 593	.....	.....	.....	.....
1948	145 165 821	57 734 770	122 610 001	37 654 211	.....	.....	.....	.....
1949	120 373 215	41 929 866	130 736 145	38 181 214	.....	.....	616	3 735
1950	128 830 683	41 052 905	131 697 239	43 769 392	.....	.....	4 964	27 579
1951	124 037 18'	50 316 015	153 091 761	67 164 754	.....	.....	.....	.....
1952	129 250 197	45 936 692	169 130 882	59 189 656	.....	.....	102 997	790 000
1953	135 004 129	39 481 244	173 407 848	40 810 618	.....	.....	816 898	5 474 924
1954	150 807 088	45 482 505	151 555 559	34 805 755	.....	.....	899 240	6 763 105
1955	137 241 656	45 161 245	194 680 177	52 048 909	.....	.....	486 018	3 733 891
1956	128 691 681	44 702 619	201 327 284	58 934 801	.....	.....	554 223	3 228 756
1957	127 732 462	39 568 086	203 787 462	50 206 681	.....	.....	335 616	2 190 847
1958	133 615 439	34 627 075	195 952 146	43 234 839	.....	.....	324 174	2 200 637
1959	130 372 360	33 542 306	182 498 693	44 169 198	.....	.....	571 769	4 193 442
1960	151 321 570	38 661 912	182 977 897	50 656 726	2 456	9 500	770 421	6 363 848
1961	174 307 617	42 313 569	175 970 780	45 370 891	.....	.....	1 052 651	10 292 847
1962	152 080 806	34 537 454	187 528 084	51 356 376	.....	.....	1 211 147	12 082 540
1963	142 869 197	37 834 714	182 734 698	53 069 163	.....	.....	1 627 342	18 326 911
1964	121 896 644	39 402 293	181 797 313	58 648 561	12 812	47 063	1 869 009	20 746 424
1965	113 480 794	43 149 171	141 179 547	48 666 933	3 306 274	12 405 344	1 816 684	20 419 487
1966	95 929 798	34 436 934	138 401 395	47 666 540	7 754 088	27 606 061	1 964 410	21 498 581
1967	94 406 546	31 432 079	119 217 472	39 248 539	7 945 782	31 183 064	1 952 074	20 778 934
1968	105 063 971	32 782 257	135 803 151	43 550 181	8 980 988	32 552 722	1 954 468	20 820 765
1969	95 286 815	33 693 539	134 565 199	46 639 024	12 064 350	47 999 442	1 900 311	21 437 569
1970	97 448 607	35 096 021	125 005 208	44 111 055	14 186 706	52 561 796	1 882 266	19 787 845
1971	112 865 575	34 711 408	138 549 629	49 745 789	9 926 694	36 954 846	1 704 650	17 391 883
1972	88 109 663	28 896 566	121 719 968	47 172 894	12 719 391	43 260 349	1 750 738	18 153 612
1973	84 890 924	30 477 936	137 380 768	62 564 751	13 785 264	51 851 509	1 139 698	11 642 379
1974	55 252 692	23 333 016	77 733 732	59 582 753	13 789 825	60 791 552	1 420 160	12 906 063
1975	70 603 483	24 450 158	99 668 230	80 572 872	13 026 627	71 201 391	1 306 930	12 742 227
1976	85 407 582	32 796 533	106 498 987	65 499 108	14 088 686	94 109 138	1 305 840	15 273 878
1977	78 172 646	42 316 293	103 780 228	61 301 001	15 521 970	142 057 947	1 255 277	14 760 526
1978	81 064 539	51 640 564	95 618 111	52 048 701	13 055 203	167 714 272	445 317	7 362 345
1979	84 451 905	88 100 363	88 418 642	61 890 891	10 766 497	321 228 104	615 569	11 597 462
1980	76 709 447	66 096 223	67 481 328	49 363 417	11 209 501	288 934 398	653 324	13 670 233
Totals	7 997 094 241	1 770 759 536	7 578 097 715	1 979 626 928	182 155 060	1 482 505 196	34 425 083	369 885 164

Table 3-7A—Mineral Production by Mining

Division	Period	Placer Gold		Metals	Industrial Minerals	Structural Materials
		Quantity	Value			
		g	$	$	$	$
Alberni	1979			44 641 124		917 051
	1980			**43 126 081**		**2 355 915**
	To Date	50 294	33 253	370 563 072	9 398	11 120 580
Atlin	1979	58 342	763 144			21 686
	1980	**41 917**	**922 991**	**5 043**		**83 380**
	To Date	23 084 229	19 625 001	38 176 250	20 325	490 569
Cariboo	1979	23 004	277 976	121 356 715	33 025	10 241 475
	1980	**21 841**	**483 773**	**125 949 023**	**138 273**	**15 887 804**
	To Date	81 309 256	55 262 991	739 304 384	1 169 282	77 507 729
Clinton	1979	975	11 791			2 547 997
	1980	**445**	**9 882**	**52**		**4 120 626**
	To Date	317 769	264 742	848 429	162 427	14 550 121
Fort Steele	1979			166 856 343	2 283 198	1 339 489
	1980			**150 637 943**	**5 149 520**	**2 901 123**
	To Date	639 241	472 087	3 105 129 356	34 858 832	18 612 991
Golden	1979			17 538	3 783 744	483 155
	1980	**1 816**	**40 371**	**300**	**5 388 986**	**830 648**
	To Date	16 403	51 639	66 302 470	37 659 924	6 095 426
Greenwood	1979	1 346	16 274	4 930 911	87 800	532 207
	1980	**15**	**334**	**6 733 108**	**90 000**	**1 109 268**
	To Date	159 178	132 270	256 945 247	2 529 936	5 407 177
Kamloops	1979	13 812	166 963	358 878 012		17 917 942
	1980	**11 230**	**249 675**	**373 926 394**	**2 000**	**22 854 137**
	To Date	883 329	1 021 423	1 779 395 163	6 542 538	126 922 832
Liard	1979	14 891	180 016	8 422 918	70 432 192	5 083 171
	1980	**18 121**	**402 878**	**10 600 895**	**91 483 287**	**9 012 362**
	To Date	1 598 315	1 841 047	38 180 311	648 404 312	39 501 269
Lillooet	1979	418	5 057			439 890
	1980	**229**	**5 090**	**8 487**		**535 474**
	To Date	2 893 995	1 948 000	148 282 333	473 095	5 381 674
Nanaimo	1979	3 800	45 939	172 355 903	119 594	11 039 696
	1980			**203 359 927**	**81 525**	**15 281 173**
	To Date	30 735	65 239	1 176 589 771	3 039 943	138 161 715
Nelson	1979			127 479	1 353 105	2 096 353
	1980			**293 440**	**1 567 334**	**3 450 862**
	To Date	111 535	89 026	409 608 054	10 984 360	19 480 546
New Westminster	1979			17 168		29 860 052
	1980					**29 653 102**
	To Date	975 418	597 152	63 768 973	1 611 625	352 518 130
Nicola	1979			39 779 612		307 874
	1980			**29 043 182**		**532 380**
	To Date	7 278	4 764	488 293 188	10 050	3 943 034
Omineca	1979	1 918	23 189	197 711 930	1 755	2 924 269
	1980			**227 748 617**	**651 740**	**14 363 353**
	To Date	1 757 925	1 532 339	1 379 347 635	2 214 315	36 277 478
Osoyoos	1979	264	3 186	100 373 878	19 327	542 425
	1980	**1 743**	**38 750**	**75 542 631**	**33 873**	**755 390**
	To Date	9 472	47 402	640 950 134	6 835 314	8 650 832
Revelstoke	1979	491	10 061	3 000		508 491
	1980	**2 747**	**55 326**	**20 416**		**3 319 530**
	To Date	239 061	229 864	15 523 830		8 451 612
Similkameen	1979	2 065	24 734	72 480 723		212 744
	1980	**442**	**9 820**	**90 503 650**		**690 812**
	To Date	1 417 911	912 758	503 050 859	18 558	6 920 235
Skeena	1979	280	3 382	24 779 427		3 885 397
	1980			**20 285 440**		**18 147 539**
	To Date	143 447	108 951	724 872 117	1 240 215	50 959 390
Slocan	1979			6 653 541		210 381
	1980			**10 341 620**		**451 006**
	To Date	11 384	9 397	303 907 965	7 066 964	3 951 529
Trail Creek	1979			73 928		693 766
	1980			**56 995**		**1 331 588**
	To Date	26 469	24 260	91 118 298		7 978 767
Vancouver	1979	365	4 417	13 401 366		48 611 369
	1980			**13 836 716**		**65 538 358**
	To Date	6 026	9 723	345 960 572		353 787 978
Vernon	1979	23 286	281 495		8 325	2 538 694
	1980	**7 984**	**177 496**	**6 635**	**10 573**	**4 603 676**
	To Date	116 328	532 340	378 049	244 239	26 417 052
Victoria	1979					31 677 157
	1980					**24 516 151**
	To Date	19 533	15 680	24 812 286	190 811	410 977 292
Not Assigned	1979	68 849	832 294	15 265 327	4 981 919	3 906 398
	1980	**171 574**	**3 816 990**	**40 762 209**	**11 328 896**	
	To Date	47 850 382	22 496 824	448 655 449	92 831 163	78 939 107
Totals	1979	214 106	2 649 918	1 348 126 843	83 100 984	178 539 129
	1980	**280 104**	**6 213 376**	**1 422 788 804**	**115 526 007**	**242 325 657**
	To Date	163 674 913	107 328 172	13 159 964 195	858 117 626	1 813 005 065

Divisions, 1979 and 1980, and Total to Date

Coal		Crude Oil and Condensates		Natural Gas Delivered to Pipeline		Butane and Propane		Division Totals
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
t	$	m^3	$	10^3m^3	$	m^3	$	$
								45 558 175
								45 481 996
								381 726 303
								784 830
								1 011 414
								58 312 145
								131 909 191
263	1 100							**142 458 873**
								873 245 486
								2 559 788
								4 130 560
10 570 145	439 273 917							15 825 719
10 823 370	**461 487 983**							609 752 957
136 780 499	2 881 178 242							**620 176 569**
								6 040 251 508
								4 284 437
								6 260 305
								110 109 459
								5 567 192
								7 932 710
								265 014 630
								376 962 917
13 687	59 765							**397 032 206**
								1 913 941 721
		2 356 910	184 894 589	9 364 668	699 508 127	197 547	11 974 409	980 495 422
		2 172 584	**201 610 507**	**8 931 833**	**546 911 784**	**165 063**	**12 541 083**	**872 562 796**
131 923	1 515 507	56 188 844	1 575 593 233	146 002 546	2 996 037 625	3 131 637	61 574 005	5 362 647 309
								444 947
								549 051
								156 085 102
								183 561 132
67 425 673	301 144 744							**218 722 625**
								1 619 001 412
								3 573 937
								5 311 636
								440 161 986
								29 877 220
								29 653 102
								418 495 880
								40 087 486
2 657 660	11 080 836							**29 575 562**
225	6 225							503 331 872
160	**4 874**							200 667 368
457 352	3 456 952							**242 768 584**
								1 422 828 719
								100 938 816
1 018	5 008							**76 370 644**
								656 488 690
								521 552
								3 395 272
								24 205 306
								72 718 201
4 188 851	19 553 725							**91 204 282**
								530 456 135
								28 668 206
33	116							**38 432 979**
								777 180 789
								6 863 922
								10 792 626
								314 935 855
								767 694
								1 388 583
								99 121 325
								62 017 152
								79 375 074
								699 758 273
								2 828 514
								4 798 360
								27 571 680
								31 677 157
								24 516 151
								435 996 069
								24 985 938
								55 908 095
								642 922 543
10 570 370	439 280 152	2 356 910	184 894 589	9 364 668	699 508 127	197 547	11 974 409	2 948 074 151
10 823 530	**461 492 857**	**2 172 584**	**201 610 507**	**8 931 833**	**546 911 784**	**165 063**	**12 541 083**	**3 009 810 075**
211 656 959	3 217 995 995	56 188 844	1 575 593 233	146 002 546	2 996 037 625	3 131 637	61 574 005	23 789 615 916

Table 3-7B—Production of Lode Gold, Silver, Copper, Lead and Zinc by Mining Divisions, 1979 and 1980, and Total to Date

Division	Period	Lode Gold		Silver		Copper		Lead		Zinc		Division Total
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	
		g	$	g	$	kg	$	kg	$	kg	$	$
Alberni	1979	746 359	8 556 256	32 192 378	12 595 419	3 301 045	7 160 051	2 541 656	2 769 095	15 613 192	13 418 635	44 499 456
	1980	**400 124**	**9 773 483**	**16 844 804**	**13 346 692**	**1 712 743**	**4 767 999**	**1 335 991**	**1 581 808**	**14 929 824**	**13 518 379**	**42 988 361**
	To Date	16 320 299	48 999 269	325 111 142	56 269 063	51 868 487	70 455 178	22 867 369	12 469 207	225 565 910	128 814 411	317 007 128
Atlin	1979											
	1980			**10 111**	**5 043**							**5 043**
	To Date	10 706 647	12 131 576	105 795 115	3 002 695	11 239 012	8 160 361	10 818 897	3 453 882	41 309 830	10 865 614	37 614 128
Cariboo	1979			3 036 104	1 672 851	30 977 166	79 490 069					81 162 920
	1980	**137 273**	**3 145 495**	**4 238 531**	**3 869 147**	**31 480 649**	**84 349 457**	**8 828**	**7 201**	**2 215**	**1 221**	**91 372 521**
	To Date	37 530 886	46 492 791	29 564 662	8 612 932	308 903 312	537 940 932	20 718	11 194	2 445	1 241	593 059 090
Clinton	1979											
	1980			**99**	**52**							**52**
	To Date	727 499	827 328	982 518	14 289	26 103	5 905	88	7			847 529
Fort Steele	1979			96 025 705	38 462 209			83 900 138	86 967 777	57 227 253	37 781 376	163 211 362
	1980			**77 631 542**	**60 959 612**			**69 402 033**	**59 222 917**	**41 827 743**	**28 017 318**	**148 199 847**
	To Date	390 707	749 363	8 214 882 865	346 147 777	7 163 855	12 534 149	6 751 009 040	1 475 188 084	5 115 205 171	1 215 364 434	3 049 983 807
Golden	1979	24	342	19 502	12 540			3 582	3 950	858	706	17 538
	1980			**568**	**300**							**300**
	To Date	13 989	25 757	143 550 213	4 943 871	532 092	367 849	117 957 087	26 297 805	152 338 678	33 466 756	65 102 038
Green-wood	1979	3 541	46 071	9 571 277	4 722 171	34	55	82 216	87 607	103 232	73 105	4 929 009
	1980	**2 633**	**61 700**	**10 009 486**	**6 527 024**	**35**	**86**	**81 232**	**66 299**	**107 285**	**76 120**	**6 731 229**
	To Date	43 569 088	40 745 195	1 416 803 229	56 598 430	273 352 616	153 550 519	11 985 638	2 962 418	11 835 695	2 876 285	256 732 847
Kamloops	1979	1 901 420	23 274 745	28 503 885	12 740 162	105 000 817	241 118 092	13 768	15 177	3 412	1 881	277 150 057
	1980	**1 483 262**	**34 591 453**	**29 715 994**	**22 603 193**	**107 300 372**	**264 670 220**					**321 864 866**
	To Date	6 830 408	70 120 367	235 438 112	57 363 548	889 032 915	1 462 520 467	401 143	122 559	245 652	53 388	1 590 180 329
Liard	1979	557 374	8 155 921	510 159	266 997							8 422 918
	1980	**469 285**	**10 598 427**	**4 582**	**2 468**							**10 600 895**
	To Date	1 030 125	18 758 468	548 550	270 881	13 570 392	19 147 861	7 428	2 736	804	286	38 180 232
Lillooet	1979											
	1980	**373**	**8 401**	**139**	**86**							**8 487**
	To Date	130 198 028	147 473 572	30 730 619	720 071	181	41	28 335	2 548	7	2	148 196 234
Nanaimo	1979	1 628 454	20 284 336	9 896 099	4 624 648	48 070 311	119 716 070					144 625 054
	1980	**1 695 233**	**41 421 615**	**12 110 947**	**10 354 583**	**47 839 401**	**126 778 320**					**178 554 518**
	To Date	20 737 230	116 524 012	141 225 965	26 271 074	481 776 020	800 826 619					943 621 705
Nelson	1979	10 877	114 783	8 958	5 760			4 318	4 722	4 016	2 214	127 479
	1980	**11 849**	**277 075**	**18 275**	**11 936**	**62**	**68**	**3 989**	**3 252**	**2 012**	**1 109**	**293 440**
	To Date	41 755 736	42 456 331	324 105 782	9 139 494	6 765 541	1 689 264	240 836 917	69 419 072	686 788 276	223 721 905	346 426 066
New West-minster	1979	1 067	17 168									17 168
	1980											
	To Date	140 160	131 544	470 246	7 729	11 333 143	11 553 105	12 893	1 119	5 786	481	11 693 978
Nicola	1979	93	1 575	3 235	2 591	15 618 019	38 483 495	225	248	158	87	38 487 996
	1980	**13 374**	**342 795**	**4 230**	**2 716**	**10 409 849**	**27 182 299**	**146**	**119**	**85**	**71**	**27 528 000**
	To Date	356 688	740 682	8 605 983	140 939	379 748 968	478 336 325	1 017 092	91 649	147 156	11 135	479 320 730

Omineca	1979	1 046 543	15 260 608	5 004 778	3 010 618	29 460 114	73 754 794	13 930	15 568	10 367	5 698	92 047 286
	1980	**1 188 153**	**24 141 931**	**5 036 463**	**3 058 492**	**29 271 503**	**69 819 990**	**15 718**	**12 822**	**22 664**	**12 491**	**97 045 726**
	To Date	12 495 859	78 588 326	379 992 577	20 609 733	317 168 552	515 604 949	13 846 272	3 963 024	19 651 007	6 205 914	624 971 946
Osoyoos	1979	110 010	1 423 681	10 265 906	6 182 869	10 224 828	26 840 760	6 208	7 254	13 607	7 800	34 462 364
	1980	**75 214**	**1 967 790**	**6 976 261**	**4 788 945**	**8 784 006**	**21 991 126**	**2 414**	**2 185**	**8 421**	**4 517**	**28 754 563**
	To Date	53 513 557	60 781 069	213 384 028	30 404 028	149 089 345	231 040 255	304 925	101 152	200 010	77 542	322 404 046
Revel-stoke	1979	124	2 727	342	220	.....	.....	.....	.....	.....	.....	.....
	1980	**187**	**3 600**	**18 059**	**12 000**	.....	.....	30	33	30	20	3 000
	To Date	1 163 843	1 088 308	128 335 444	2 833 585	69 710	51 037	**4 922**	**4 011**	**1 303**	**805**	**20 416**
Similka-meen	1979	1 036 648	11 582 483	2 849 794	1 139 597	25 469 090	59 755 716	16 411 486	3 880 101	12 315 621	3 317 982	11 171 013
	1980	**1 023 740**	**23 068 167**	**3 448 082**	**2 609 833**	**25 258 993**	**64 825 650**	.....	.....	.....	.....	72 477 796
	To Date	13 321 199	67 781 544	158 577 759	9 346 440	448 472 260	425 770 367	178 550	15 137	36 494	5 258	**90 503 650**
Skeena	1979	91 111	1 352 554	3 720 505	2 748 541	3 674 403	9 431 654	11 291	13 491	15 313	8 579	502 918 746
	1980	**58 439**	**1 296 192**	**2 866 809**	**2 089 018**	**2 118 762**	**5 284 208**	**143**	**436**	**19 461**	**10 055**	13 554 819
	To Date	78 219 738	72 707 268	2 289 990 952	63 610 387	514 569 095	400 189 091	27 254 885	5 469 977	7 857 492	2 571 360	**8 679 909**
Slocan	1979	3 950	59 971	9 970 438	4 926 977	40	50	923 416	977 360	900 645	673 046	544 548 083
	1980	**1 925**	**39 805**	**11 320 150**	**8 577 250**	**522**	**575**	**827 676**	**896 375**	**770 380**	**795 762**	6 637 404
	To Date	599 882	907 361	2 489 422 622	76 083 340	7 053	2 758	517 802 008	111 269 789	436 542 220	109 747 527	**10 309 767**
Trail Creek	1979	4 945	71 550	3 515	2 378	.....	.....	.....	.....	.....	.....	298 010 775
	1980	**2 582**	**56 295**	**1 462**	**700**	.....	.....	.....	.....	.....	.....	73 928
	To Date	92 884 927	63 641 417	117 185 500	2 532 004	55 592 776	18 245 404	175 629	61 660	198 043	87 750	**56 995**
Vancouver	1979	923 649	11 315 831	1 064 361	763 627	37 938	72 269	592 288	630 531	868 607	619 108	84 568 235
	1980	**543 015**	**11 353 811**	**1 723 747**	**1 090 490**	**38 878**	**71 717**	**723 511**	**591 279**	**997 635**	**729 419**	13 401 366
	To Date	19 862 088	54 276 264	196 083 984	9 230 341	507 070 097	243 098 195	12 219 390	4 528 417	112 542 747	33 621 279	**13 836 716**
Vernon	1979	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	344 754 496
	1980	**204**	**4 924**	**2 982**	**1 711**	.....	.....	.....	.....	.....	.....	.....
	To Date	165 454	186 838	2 249 708	150 004	297	100	86 363	29 276	33 511	11 299	**6 635**
Victoria	1979	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	377 517
	1980	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	To Date	1 375 157	1 236 720	29 478 396	654 567	29 775 654	22 581 791	95 298	19 848	1 618 731	283 923	24 776 849
Not As-signed	1979	—3 379	—39 446	1 470 577	820 481	329 196	536 848	—3 641 161	—3 392 450	13 657 952	9 298 636	7 224 069
	1980	**90 527**	**1 777 114**	**21 818 488**	**16 637 015**	**459 055**	**881 901**	**4 302 844**	**3 707 519**	**8 792 300**	**6 196 150**	**29 199 699**
	To Date	823 675	2 846 798	306 089 887	37 031 945	27 158 778	17 418 295	251 756 770	51 398 875	753 656 429	208 521 156	317 217 069
Total	1979	8 062 810	101 481 156	214 117 518	94 700 656	272 163 001	656 359 923	84 451 905	88 100 363	88 418 642	61 890 891	1 002 532 989
	1980	**7 197 312**	**163 930 073**	**203 801 811**[1]	**156 548 306**[1]	**264 674 830**	**670 623 616**	**76 709 447**	**66 096 223**	**67 481 328**	**49 363 417**	**1 106 561 635**
	To Date	584 732 869	950 218 168	17 288 605 858	821 989 167	4 484 286 254	5 431 090 817	7 997 094 241	1 770 759 536	7 578 097 715	1 979 626 928	10 953 684 616

[1] Includes 79 344 g of silver valued at $41,920 recovered from placer gold.

Table 3-7C Production of Miscellaneous Metals by Mining Divisions, 1979 and 1980, and Total to Date

Division	Period	Antimony		Bismuth		Cadmium		Chromite		Iron Concentrates		Manganese		Mercury	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		kg	$	kg	$	kg	$	t	$	t	$	t	$	kg	$
Alberni	1979					22 944	141 668								
	1980					**22 729**	**137 720**								
	To Date					605 674	3 921 233			4 293 517	49 634 711				
Atlin	1979														
	1980														
	To Date					144 791	561 762								
Cariboo	1979														
	1980														
	To Date														
Clinton	1979														
	1980														
	To Date							114	900						
Fort Steele	1979									33 856	492 251				
	1980									**27 476**	**549 520**				
	To Date					1 542 022	10 064 486			1 389 324	16 273 556				
Golden	1979														
	1980														
	To Date	18 172	14 906			259 162	1 185 526								
Greenwood	1979					404	1 902								
	1980					**328**	**1 879**								
	To Date					37 615	181 005	608	31 395						
Kamloops	1979														
	1980														
	To Date					99	641			19 204	95 851			4 984	5 795
Liard	1979														
	1980														
	To Date														
Lillooet	1979														
	1980														
	To Date	6 108	4 321											4 187	41 304
Nanaimo	1979														
	1980														
	To Date									15 872 977	152 633 401				
Nelson	1979														
	1980														
	To Date					4 059 962	19 859 034								
New Westminster	1979														
	1980														
	To Date														
Nicola	1979									44 528	1 291 616				
	1980									**44 211**	**1 515 182**				
	To Date									387 780	8 972 458				

Omineca	1979														
	1980														
	To Date	53 697	21 882			135 245	628 342							6 085 216	49 171 164
Osoyoos	1979														
	1980														
	To Date														
Revelstoke	1979											15			
	1980														
	To Date	4 261	3 455			46 997	176 102								
Similkameen	1979														
	1980														
	To Date														
Skeena	1979									589 642	11 224 608				
	1980									**581 637**	**11 605 531**				
	To Date					64 360	316 764			12 461 782	142 273 262				
Slocan	1979					3 282	16 137								
	1980					**1 810**	**31 853**								
	To Date	14 453	8 133			1 243 983	5 880 897					491	8 160		
Trail Creek	1979														
	1980														
	To Date					52	210			499	1 925				
Vancouver	1979														
	1980														
	To Date					257 261	1 206 076								
Vernon	1979														
	1980														
	To Date					86	532								
Victoria	1979														
	1980														
	To Date					3 175	10 929								
Not Assigned	1979	177 046	916 081	33 809	173 667	212 466	1 257 799					1 058	24 508		
	1980	**78 654**	**416 080**	**23 501**	**136 306**	**67 493**	**389 227**								
	To Date	27 298 723	28 603 781	3 318 561	16 309 658	12 413 557	44 974 871								
Totals	1979	177 046	916 081	33 809	173 667	239 096	1 417 506			668 026	13 008 475				
	1980	**78 654**	**416 080**	**23 501**	**136 306**	**92 360**	**560 679**			**653 324**	**13 670 233**				
	To Date	27 395 414	28 656 478	3 318 561	16 309 658	20 814 041	88 968 410	722	32 295	34 425 083	369 885 164	1 564	32 668	6 094 387	49 218 263

Table 3-7C—Production of Miscellaneous Metals by Mining Divisions, 1979 and 1980, and Total to Date—Continued

Division	Period	Molybdenum		Nickel		Palladium		Platinum		Tin		Tungsten (WO_3)		Other Value	Division Total
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
		kg	$	kg	$	kg	$	g	$	kg	$	kg	$	$	$
Alberni	1979														141 668
	1980														**137 720**
	To Date														53 555 944
Atlin	1979														
	1980														
	To Date											132	360		562 122
Cariboo	1979	1 023 637	40 193 142					48	653						40 193 795
	1980	**1 298 267**	**34 576 582**												**34 576 582**
	To Date	15 846 081	146 220 911					1 883	2 952			12 564	21 431		146 245 294
Clinton	1979														
	1980														
	To Date														900
Fort Steele	1979									198 955	3 152 730				3 644 981
	1980									**108 835**	**1 888 576**				**2 438 096**
	To Date									9 512 566	28 719 323			88 184[1]	55 145 549
Golden	1979														
	1980														
	To Date														1 200 432
Greenwood	1979														1 902
	1980														**1 879**
	To Date														212 400
Kamloops	1979	2 366 139	81 727 955												81 727 955
	1980	**2 261 435**	**52 061 528**												**52 061 528**
	To Date	14 979 752	189 112 547												189 214 834
Liard	1979														
	1980														
	To Date							62	79						79
Lillooet	1979														
	1980														
	To Date	666	2 440					93	113			14 675	37 921		86 099
Nanaimo	1979	1 111 400	27 730 849												27 730 849
	1980	**1 113 074**	**24 805 409**												**24 805 409**
	To Date	6 736 364	80 334 665												232 968 066
Nelson	1979														
	1980														
	To Date	6 819	18 378									8 056 095	43 304 576		63 181 988
New Westminster	1979														
	1980														
	To Date			23 337 783	51 698 754									376 241[2]	52 074 995
Nicola	1979														1 291 616
	1980														**1 515 182**
	To Date														8 972 458

Omineca	1979	3 738 530	105 664 644												105 664 644
	1980	**4 651 559**	**130 702 891**												**130 702 891**
	To Date	92 515 318	699 856 017					93	154			1 002 839	4 697 710	420[2]	754 375 689
Osoyoos	1979	2 526 791	65 911 514												65 911 514
	1980	**1 885 166**	**46 788 068**												**46 788 068**
	To Date	38 755 442	318 546 088												318 546 088
Revelstoke	1979														
	1980														
	To Date	1 190 713	4 167 573									3 531	5 687		4 352 817
Similkameen	1979							216	2 927						2 927
	1980														
	To Date							40 246	132 113						132 113
Skeena	1979														11 224 608
	1980														**11 605 531**
	To Date	10 470 935	37 732 288									166	331	1 389[3]	180 324 034
Slocan	1979														16 137
	1980														**31 853**
	To Date														5 897 190
Trail Creek	1970														
	1980														
	To Date	1 652 970	6 514 289				23 296	30 462	1 649	3 177					6 550 063
Vancouver	179														
	1980														
	To Date														1 206 076
Vernon	1979														
	1980														
	To Date														532
Victoria	1979														
	1980														
	To Date														35 437
Not Assigned	1979								16	213	42 029	666 218		5 027 280	8 041 258
	1980										**31 482**	**550 305**		**10 070 592**	**11 562 510**
	To Date								16	213	286 537	2 882 109		38 667 748	131 438 380
Totals	1979	10 766 497	321 228 104						280	3 793	240 984	3 818 948			5 027 280	345 593 854
	1980	**11 289 501**	**288 934 390**								**139 517**	**2 438 881**			**10 070 592**	**316 227 169**
	To Date	182 155 060	1 482 505 196	23 337 783	51 698 754	23 296	30 462	44 042	138 801	9 799 103	31 601 432	9 090 002	48 068 016	39 133 982	2 206 279 579

[1] Magnesium, page 64. [2] Cobalt, page 61. [3] Selenium, page 66.

Table 3-7D—Production of Industrial Minerals by

Division	Period	Asbestos		Barite[1]		Diatomite		Fluxes (Quartz and Limestone)		Granules (Quartz, Limestone, and Granite)	
		Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
		t	$	t	$	t	$	t	$	t	$
Alberni	1979										
	1980										
	To Date										
Atlin	1979										
	1980										
	To Date										
Cariboo	1979					1 452	33 025				
	1980					**3 615**	**138 273**				
	To Date					29 833	1 025 802			44	168
Clinton	1979										
	1980										
	To Date										
Fort Steele	1979										
	1980										
	To Date			7	80						
Golden	1979							73	1 116		
	1980							**61**	**1 037**		
	To Date			398 388	4 489 227			3 093	14 765		
Greenwood	1979									2 168	87 800
	1980									**1 977**	**90 000**
	To Date							1 624 308	1 540 319	5 078	306 039
Kamloops	1979										
	1980									**156**	**2 000**
	To Date									703	14 230
Liard	1979	94 286	65 520 069								
	1980	**180 089**	**81 688 936**								
	To Date	1 703 489	609 185 903								
Lillooet	1979										
	1980										
	To Date										
Nanaimo	1979							27 657	119 584		
	1980							**20 500**	**81 525**		
	To Date							1 070 901	2 262 766	31 506	777 149
Nelson	1979									27 162	1 350 105
	1980									**28 125**	**1 567 334**
	To Date							6 895	8 174	283 112	10 920 285
New Westminster	1979										
	1980										
	To Date									99 490	1 611 625
Nicola	1979										
	1980										
	To Date										
Omineca	1979									25	1 755
	1980									**26**	**1 740**
	To Date									174	12 973
Osoyoos	1979									719	19 327
	1980									**1 129**	**33 873**
	To Date							728 113	3 689 031	196 061	2 803 812
Similkameen	1979										
	1980										
	To Date										
Skeena	1979										
	1980										
	To Date							545 232	1 050 722		
Vancouver	1979										
	1980										
	To Date									26 936	418 606
Vernon	1979							11	8 325		
	1980							**12**	**10 573**		
	To Date							2 926	49 298	7 210	193 963
Victoria	1979										
	1980										
	To Date							286	3 505	8 713	157 080
Not Assigned	1979										
	1980										
	To Date										
Totals	1979	94 286	65 520 069			1 452	33 025	27 741	129 035	30 074	1 458 987
	1980	**180 089**	**81 688 936**			**3 615**	**138 273**	**20 573**	**93 135**	**31 393**	**1 694 947**
	To Date	1 703 489	609 185 903	398 395	4 489 307	29 833	1 025 802	3 981 241	8 628 608	659 027	17 112 930

[1] From 1972, excludes production which is confidential.
Other: *See* notes on individual materials listed alphabetically on pages 59 to 68.
[2] Natro-alunite.
[3] Hydromagnesite.
[4] Volcanic ash.
[5] Magnesium sulphate.
[6] Sodium carbonate.
[7] Phosphate rock.

Mining Divisions, 1979 and 1980, and Total to Date

Gypsum and Gypsite		Jade		Mica		Sulphur		Other Value	Division Total
Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value		
t	$	kg	$	t	$	t	$	$	$
								9 [illegible]	[illegible]
								20 [illegible]	[illegible]
				4 542 160	185 [illegible]			[illegible]	[illegible]
792	6 256							[illegible]	[illegible]
						[illegible]	[illegible]		[illegible]
102 480	298 824					**90 997**	**6 189 520**		**6 189 520**
718 557	3 782 628					1 678 292	14 543 034	16 [illegible]	[illegible]
751 867	**5 387 949**								**6 [illegible]**
7 752 410	33 154 656							[illegible]	[illegible]
								[illegible]	[illegible]
								[illegible]	**[illegible]**
								[illegible]	[illegible]
1 151 179	6 525 178			192 640	2 [illegible]			[illegible]	[illegible]
		258 505	1 325 777			147 437	1 986 146		[illegible]
		384 086	**930 241**			**152 372**	**8 864 110**		**[illegible]**
		1 651 454	5 733 505			1 310 970	53 [illegible]		[illegible]
		253 391	867 986					8 [illegible]	[illegible]
									[illegible]
									[illegible]
									[illegible]
									1 967 [illegible]
								[illegible]	[illegible]
									[illegible]
2 184	10 050								[illegible]
									[illegible]
		145 150	**650 000**						**[illegible]**
		703 089	2 189 882					11 [illegible]	[illegible]
									[illegible]
				720 664	25 [illegible]			[illegible]	**[illegible]**
									[illegible]
227	1 700							16 [illegible]	[illegible]
									[illegible]
				287 689	10 [illegible]	37 [illegible]	178 [illegible]		[illegible]
									[illegible]
						[illegible]	[illegible]	[illegible]	[illegible]
									[illegible]
									[illegible]
				72 801	3 [illegible]				[illegible]
									[illegible]
								[illegible]	[illegible]
						146 [illegible]	3 [illegible]	[illegible]	[illegible]
						156 064	**7 [illegible]**	**[illegible]**	**[illegible]**
						[illegible]	[illegible]	[illegible]	[illegible]
718 557	3 782 628	258 505	1 325 777			383 [illegible]	9 [illegible]	[illegible]	[illegible]
751 867	**5 387 949**	**609 156**	**1 580 241**			**309 [illegible]**	**23 [illegible]**	**[illegible]**	**[illegible]**
8 989 192	39 704 644	2 587 914	8 301 353	5 815 954	185 818	9 [illegible]	158 [illegible]	[illegible]	[illegible]

[1] Iron oxide and ochre
[2] Talc
[3] Fluorspar
[4] Arsenious oxide
[5] Perlite
[6] Bentonite

Table 3-7E—Production of Structural Materials by Mining Divisions 1979 and 1980, and Total to Date

Division	Period	Cement	Lime and Limestone	Building Stone	Rubble, Riprap, and Crushed Rock	Sand and Gravel	Clay Products	Unclassified Materials	Division Total
		$	$	$	$	$	$	$	$
Alberni	1979					917 051			917 051
	1980					**2 355 915**			**2 355 915**
	To Date				346 659	10 773 921			11 120 580
Atlin	1979					21 686			21 686
	1980					**83 380**			**83 380**
	To Date		1 108		102 453	387 008			490 569
Cariboo	1979		476 521		2 766 143	6 998 811			10 241 475
	1980		**1 110 337**		**5 579 023**	**9 198 444**			**15 887 804**
	To Date		5 261 949		19 821 912	52 091 411	332 457		77 507 729
Clinton	1979				38 300	2 509 697			2 547 997
	1980				**111 790**	**4 008 836**			**4 120 626**
	To Date				3 349 220	11 200 901			14 550 121
Fort Steele	1979				9 00	1 330 489			1 339 489
	1980				**51 000**	**2 850 123**			**2 901 123**
	To Date		43 873	71 941	3 035 311	15 445 948	15 918		18 612 991
Golden	1979					483 155			483 155
	1980					**830 648**			**830 648**
	To Date		1 000	50 840	255 923	5 659 504	128 159		6 095 426
Greenwood	1979		16 900	20		515 287			532 207
	1980		**40 250**	**50**		**1 068 968**			**1 109 268**
	To Date		107 971	161 090	278 474	4 738 359	121 283		5 407 177
Kamloops	1979	14 151 699			1 394 030	2 372 213			17 917 942
	1980	**17 759 447**			**712 567**	**4 382 123**			**22 854 137**
	To Date	77 110 131	25 067	19 800	19 326 997	30 368 458	72 379		126 922 832
Liard	1979					5 083 171			5 083 171
	1980				**2 020 030**	**6 992 332**			**9 012 362**
	To Date				4 642 838	34 858 431			39 501 269
Lillooet	1979		386 926	9 755		43 209			439 890
	1980		**437 142**		**8 700**	**89 632**			**535 474**
	To Date		1 751 148	11 755	1 131 518	2 487 253			5 381 674
Nanaimo	1979		5 951 297		708 182	4 380 217			11 039 696
	1980		**6 859 837**		**1 499 861**	**6 921 475**			**15 281 173**
	To Date		87 901 125	3 450 735	9 789 248	35 841 615	1 178 992		138 161 715
Nelson	1979		1 035 960		1 371	1 059 022			2 096 353
	1980		**1 342 634**		**31 488**	**2 076 740**			**3 450 862**
	To Date		6 356 064	437 138	623 885	12 041 485	21 974		19 480 546
New Westminster	1979		120 896		445 516	17 549 446	11 744 194		29 860 052
	1980		**98 903**		**1 080 190**	**18 086 828**	**10 387 121**		**29 653 102**
	To Date		3 900 681	20 974	27 342 653	190 387 357	130 866 465		352 518 130
Nicola	1979					307 874			307 874
	1980					**532 380**			**532 380**
	To Date			8 000	187 994	3 747 040			3 943 034
Omineca	1979		5 548	125	590 072	2 328 524			2 924 269
	1980		**8 940**		**10 033 600**	**4 320 813**			**14 363 353**
	To Date		51 717	701	13 575 155	22 o44 631	5 274		36 277 478
Osoyoos	1979					542 425			542 425
	1980					**755 390**			**755 390**
	To Date		43 774	33 018	355 349	8 218 691			8 650 832
Revelstoke	1979			9 800	13 800	484 891			508 491
	1980			**9 800**	**2 269 951**	**1 039 779**			**3 319 530**
	To Date		1 000	86 945	3 057 504	5 306 163			8 451 612
Similkameen	1979					212 744			212 744
	1980					**690 812**			**690 812**
	To Date	10 500	11 571	24 000	712 341	6 148 468	13 355		6 920 235
Skeena	1979				800 251	3 085 146			3 885 397
	1980		**16 062**		**9 038 256**	**9 093 221**			**18 147 539**
	To Date		1 661 362	144 000	15 369 802	33 770 977	13 249		50 959 390
Slocan	1979					210 381			210 381
	1980					**451 006**			**451 006**
	To Date		1 000	115 143	157 323	3 678 063			3 951 529
Trail Creek	1979					693 766			693 766
	1980					**1 331 588**			**1 331 588**
	To Date		32 500	85 520	381 393	7 479 354			7 978 767
Vancouver	1979	41 482 114				7 129 255			48 611 369
	1980	**57 446 234**				**8 092 124**			**65 538 358**
	To Date	242 149 084	40 885	4 012 560	8 681 796	97 815 061	1 088 592		353 787 978
Vernon	1979					2 538 694			2 538 694
	1980					**4 603 676**			**4 603 676**
	To Date		351 416	141 367	403 649	25 359 366	161 254		26 417 052
Victoria	1979	24 418 648	43 428			7 215 081			31 677 157
	1980	**15 675 405**	**30 939**			**8 809 807**			**24 516 151**
	To Date	324 381 441	1 215 648	55	532 563	73 992 449	10 855 136		410 977 292
Not Assigned	1979					3 906 398			3 906 398
	1980								
	To Date		315 498	505 018	2 879 844	66 085 748	3 180 828	5 972 171	78 939 107
Totals	1979	80 052 461	8 037 476	19 700	6 766 665	71 918 633	11 744 194		178 539 129
	1980	**90 881 086**	**9 945 044**	**9 850**	**32 436 456**	**98 666 100**	**10 387 121**		**242 325 657**
	To Date	643 651 156	109 076 357	9 380 600	136 341 804	760 527 662	148 055 315	5 972 171	1 813 005 065

Table 3-8A—Production of Coal, 1836–1980

Year	Quantity[1]	Value	Year	Quantity[1]	Value
	t	$		t	$
1836–59	37 985	149 548	1921	2 422 455	12 836 013
1860	14 475	56 988	1922	2 473 692	12 880 060
1861	13 995	55 096	1923	2 391 998	12 678 548
1862	18 409	72 472	1924	1 839 619	9 911 935
1863	21 687	85 380	1925	2 305 337	12 168 905
1864	29 091	115 528	1926	2 182 760	11 650 180
1865	33 345	131 276	1927	2 316 408	12 269 135
1866	25 518	100 460	1928	2 431 794	12 633 510
1867	31 740	124 956	1929	2 154 607	11 256 260
1868	44 711	176 020	1930	1 809 364	9 435 650
1869	36 376	143 208	1931	1 601 600	7 684 155
1870	30 322	119 372	1932	1 464 759	6 523 644
1871	50 310	164 612	1933	1 249 347	5 375 171
1882	50 310	164 612	1934	1 297 306	5 725 133
1873	50 311	164 612	1935	1 159 721	5 048 864
1874	82 856	244 641	1936	1 226 780	5 722 502
1875	111 912	330 435	1937	1 312 003	6 139 920
1876	141 425	417 576	1938	1 259 626	5 565 069
1877	156 525	462 156	1939	1 416 184	6 280 956
1878	173 587	522 538	1940	1 507 758	7 088 265
1879	245 172	723 903	1941	1 673 516	7 660 000
1880	271 889	802 785	1942	1 810 731	8 237 172
1881	232 020	685 171	1943	1 682 591	7 742 030
1882	286 666	846 417	1944	1 752 626	8 217 966
1883	216 721	639 897	1945	1 381 654	6 454 360
1884	400 391	1 182 210	1946	1 305 516	6 732 470
1885	371 461	1 096 788	1947	1 538 895	8 680 440
1886	331 875	979 908	1948	1 455 552	9 765 395
1887	419 992	1 240 080	1949	1 470 782	10 549 924
1888	497 150	1 467 903	1950	1 427 907	10 119 303
1889	589 133	1 739 490	1951	1 427 513	10 169 617
1890	689 020	2 034 420	1952	1 272 150	9 729 739
1891	1 045 607	3 087 291	1953	1 255 662	9 528 279
1892	839 591	2 479 005	1954	1 186 849	9 154 544
1893	993 988	2 934 882	1955	1 209 157	8 986 501
1894	1 029 204	3 038 859	1956	1 285 664	9 346 518
1895	954 727	2 824 687	1957	984 886	7 340 339
1896	909 237	2 693 961	1958	722 490	5 937 860
1897	906 610	2 734 522	1959	625 964	5 472 064
1898	1 146 015	3 582 595	1960	715 455	5 242 223
1899	1 302 088	4 126 803	1961	833 827	6 802 134
1900	1 615 688	4 744 530	1962	748 731	6 133 986
1901	1 718 692	5 016 398	1963	771 594	6 237 997
1902	1 667 960	4 832 257	1964	826 737	6 327 678
1903	1 473 933	4 332 297	1965	862 513	6 713 590
1904	1 712 739	4 953 024	1966	771 848	6 196 219
1905	1 855 121	5 511 861	1967	824 436	6 045 341
1906	1 929 540	5 548 044	1968	870 180	7 588 989
1907	2 255 214	7 637 713	1969	773 226	6 817 155
1908	2 143 225	7 356 866	1970	2 398 635	19 559 669
1909	2 439 109	8 574 884	1971	4 141 496	45 801 936
1910	3 007 074	11 108 335	1972	5 466 846	66 030 210
1911	2 305 778	8 071 747	1973	6 924 733	87 976 105
1912	2 913 778	10 786 812	1974	7 757 440	154 593 643
1913	2 461 665	9 197 460	1975	8 924 816	317 111 744
1914	2 029 400	7 745 847	1976	7 537 695	298 683 679
1915	1 883 851	7 114 178	1977	8 424 181	328 846 883
1916	2 343 671	8 900 675	1978	9 463 920	381 895 241
1917	2 209 982	8 484 343	1979	10 570 370	439 280 152
1918	2 336 238	12 833 994	1980	10 823 530	461 492 857
1919	2 207 659	11 975 671	Totals	211 656 959	3 217 995 995
1920	2 587 763	13 450 169			

[1] Quantity from 1836 to 1909 is gross mine output and includes material lost in picking and washing. For 1910 and subsequent years the quantity is that sold and used.

Table 3-8B—Coal Production and Distribution

	Raw Coal Production			Clean Coal Production	Coal Used	
	Surface	Underground	Total		Plant Use and Misc	Making Coke
	t	t	t	t	t	t
Fort Steele Mining Division						
B.C. Coal (formerly Kaiser)						
Metallurgical	5 766 578	700 521	6 467 099	5 060 005	1 257	131 856
Thermal	198 103	1 703	199 806	155 872	..	..
Byron Creek Collieries Ltd.						
Thermal	1 061 703	..	1 061 703	902 018	..	..
Coleman Collieries Ltd.						
Metallurgical	861 642	..	861 642	561 739	..	..
Fording Coal Ltd.						
Metallurgical	5 573 103	..	5 573 103	3 476 431	..	..
Totals	13 461 129	702 224	14 163 353	10 156 065	1 257	131 856
Omineca Mining Division						
Bulkley Valley Colliery Ltd.						
Thermal	160	..	160	160	11	..
Totals 1980						
Metallurgical	12 201 323	700 521	12 901 844	9 098 175	1 257	131 856
Per cent of 1980 totals	91	100	91	90	99	100
Thermal	1 259 966	1 703	1 261 669	1 058 050	11	..
Per cent of 1980 totals	9	0	9	10	1	..
Totals 1980	13 461 289	702 224	14 163 513	10 156 225	1 268	131 856

Table 3-8C—Raw and Clean Coal Produced

Year	Raw Coal Produced			Clean Coal Produced		
	Metallurgical	Thermal	Total	Metallurgical	Thermal	Total
	t	t	t	t	t	t
1973	9 806 384	77 287	9 883 671	6 992 044	58 866	7 050 910
1974	9 503 578	658 697	10 162 275	7 133 053	607 337	7 740 390
1975	12 160 856	777 937	12 938 793	8 872 438	766 733	9 579 802
1976	9 405 065	724 935	10 130 000	6 785 282	713 087	7 498 369
1977	10 564 568	993 022	11 557 590	7 793 920	786 729	8 580 649
1978	11 093 352	1 285 863	12 379 215	8 034 021	1 059 027	9 093 048
1979	13 412 935	1 214 796	14 627 731	9 676 908	906 742	10 583 650
1980	12 901 844	1 261 669	14 163 513	9 098 175	1 058 050	10 156 225

by Collieries and by Mining Division, 1980

Coal Sales							Total Coal Sold and Used		
Canada			United States	Japan	Others	Total	Quantity	Total Value	Average Value
British Columbia	Other Provinces	Total							
t	t	t	t	t	t	t	t	$	$/t
191	271	462		3 887 535	1 470 573	5 358 570	5 491 683	243 851 082	44.40
					252 171	252 171	252 171	11 781 915	46.72
50 080	611 381	661 461	1 282	219 137	35 002	916 882	916 882	26 578 000	28.99
83	121	204		676 465		676 669	676 669	29 795 457	44.03
6 232		6 232		2 885 138	594 595	3 485 965	3 485 965	149 481 529	42.88
56 586	611 773	668 359	1 282	7 668 275	2 352 341	10 690 257	10 823 370	461 487 983	42.64
149		149				149	160	4 874	30.46
6 506	392	6 898		7 549 138	75 168	9 521 204	9 654 317	423 128 068	43.83
11	0	1		97	88	89	89	92	
50 229	611 381	661 610	1 282	219 137	287 173	1 169 202	1 169 213	38 364 789	32.81
89	100	99	100	3	12	11	11	8	
56 735	611 773	668 508	1 282	7 668 275	2 352 341	10 690 406	10 823 530	461 492 857	42.64

and Coal Sold and Used, 1973–1980

Coal Sold and Used								
Metallurgical			Thermal			Totals		
Quantity	Value	Average Price Per t	Quantity	Value	Average Price Per t	Quantity	Value all Types	Average Price Per t of coal
t	$	$	t	$	$	t	$	$
6 853 120	87 406 677	12.75	71 613	569 428	7.21	6 924 733	87 976 105	12.70
7 261 404	149 025 665	20.52	496 036	5 567 978	11.22	7 757 440	154 593 643	19.93
8 104 102	305 484 901	37.70	820 714	11 626 843	14.17	8 924 816	317 111 744	35.53
6 824 493	283 753 979	41.58	713 202	14 929 700	20.93	7 537 695	298 683 679	39.63
7 615 953	314 316 005	41.27	808 228	14 639 667	18.11	8 424 181	328 846 883	39.04
8 530 370	361 254 854	42.35	933 550	20 640 387	22.11	9 463 920	381 895 241	40.35
9 591 975	412 392 598	42.99	978 395	26 887 554	27.48	10 570 370	439 280 152	41.56
9 654 317	423 128 068	43.83	1 169 213	38 364 789	32.81	10 823 530	461 492 857	42.64

Table 3-8D—Destination of B.C. Coal—1980*

Destination	B.C. Coal		Byron Creek	Coleman	Fording Coal	Bulkley Valley	Total Sales		Grand Totals
	Metallurgical	Thermal	Thermal	Metallurgical	Metallurgical	Thermal	Metallurgical	Thermal	
	t	t	t	t	t	t	t	t	t
Canada—									
B.C.	191	.....	50 080	83	6 232	149	6 506	50 229	56 735
Alberta	.....	.....	279	121	.....	.....	121	279	400
Manitoba	271	.....	59 793	.....	.....	.....	271	59 793	60 064
Ontario	.....	.....	551 309	.....	.....	.....	.....	551 309	551 309
Totals	462	.....	661 461	204	6 232	149	6 898	661 610	668 508
Foreign—									
Brazil	289 443	.....	.....	.....	.....	.....	289 443	.....	289 443
Chile	81 630	.....	.....	.....	52 559	.....	134 189	.....	134 189
Denmark	.....	252 171	.....	.....	.....	.....	.....	252 171	252 171
Greece	.....	.....	.....	.....	258 337	.....	258 337	.....	258 337
Japan	3 887 535	.....	219 137	676 465	2 885 138	.....	7 449 138	219 137	7 668 275
Korea	865 335	.....	.....	.....	114 723	.....	980 058	.....	980 058
Mexico	28 485	.....	.....	.....	.....	.....	28 485	.....	28 485
Netherlands	.....	.....	.....	.....	42 310	.....	42 310	.....	42 310
Pakistan	24 409	.....	.....	.....	.....	.....	24 409	.....	24 409
Spain	47 825	.....	.....	.....	.....	.....	47 825	.....	47 825
Sweden	49 341	.....	35 002	.....	.....	.....	49 341	35 002	84 343
Taiwan	84 105	.....	.....	.....	126 666	.....	210 771	.....	210 771
U.S.	.....	.....	1 282	.....	.....	.....	.....	1 282	1 282
Totals	5 358 108	252 171	255 421	676 465	3 479 733		9 514 306	507 592	10 021 898
Totals, all sales	5 358 570	252 171	916 882	676 669	3 485 965	149	9 521 204	1 169 202	10 690 406

* Excludes coal used at plants and for making coke.

Table 3-9—Principal Items of Expenditure Reported for Operations of all Classes

Class	Salaries and Wages	Fuel and Electricity	Process Supplies
	$	$	$
Metal Mining	192 412 691	63 205 414	222 974 902
Exploration and Development	145 009 470		
Coal	85 368 642	21 881 433	21 596 659
Petroleum and Natural Gas (Exploration and Development)	8 036 581		
Industrial Minerals	24 337 164	7 266 272	13 187 048
Structural Materials Industry	39 805 795	17 658 483	9 307 174
Totals, 1980	494 970 343	110 011 602	267 065 783
1979	387 135 371	97 166 988	211 066 592
1978	335 136 110	84 785 125	189 133 090
1977	337 382 149	71 149 313	192 025 357
1976	277 736 828	59 220 204	170 075 616
1975	246 953 568	49 104 838	154 476 238
1974	272 945 078	42 381 258	140 002 685
1973	221 877 595	36 750 711	103 840 649
1972	199 351 449	31 115 621	77 092 955
1971	179 175 692	23 166 904	68 314 944
1970	172 958 282	19 116 672	59 846 370
1969	123 450 327	14 554 123	43 089 559
1968	113 459 219	13 818 326	38 760 203
1967	94 523 495	13 590 759	34 368 856
1966	93 409 528	12 283 477	28 120 179
1965	74 938 736	11 504 343	30 590 631
1964	63 624 559	10 205 861	27 629 953
1963	57 939 294	10 546 806	12 923 325
1962	55 522 171	9 505 559	14 024 799
1961	50 887 275	8 907 034	17 787 127
1960	52 694 818	7 834 728	21 496 912
1959	49 961 996	7 677 321	17 371 638
1958	48 933 560	8 080 989	15 053 036
1957	56 409 056	8 937 567	24 257 177
1956	57 266 026	9 762 777	22 036 839
1955	51 890 246	9 144 034	21 131 572
1954	48 702 746	7 128 669	19 654 724
1953	55 543 490	8 668 099	20 979 411
1952	62 256 631	8 557 845	27 024 500
1951	52 607 171	7 283 051	24 724 101
1950	42 738 035	6 775 998	17 500 663
1949	41 023 786	7 206 637	17 884 408
1948	38 813 506	6 139 470	11 532 121
1947	32 160 338	5 319 470	13 068 948
1946	26 190 200	5 427 458	8 367 705
1945	22 620 975	7 239 726	5 756 628
1944	23 131 874	5 788 671	6 138 084
1943	26 051 467	7 432 585	6 572 317
1942	26 913 160	7 066 109	6 863 398
1941	26 050 491	3 776 747	7 260 441
1940	23 391 330	3 474 721	6 962 162
1939	22 357 035	3 266 000	6 714 347
1938	22 765 711	3 396 106	6 544 500
1937	21 349 690	3 066 311	6 845 330
1936	17 887 619	2 724 144	4 434 501
1935	16 753 367	2 619 639	4 552 730

NOTE.—This table has changed somewhat through the years, so that the items are not everywhere directly comparable. Prior to 1962, lode mining referred only to gold, silver, copper, lead, and zinc. Prior to 1964, some expenditures for fuel and electricity were included with process supplies. Process supplies (except fuel) were broadened in 1964 to include "process, operating maintenance and repair supplies . . . used in the mine/mill operations; that is explosives, chemicals, drill steel, bits, lubricants, electrical, etc. . . . . not charged to Fixed Assets Account . . . provisions and supplies sold in any company-operated cafeteria or commissary." Exploration and development other than in the field of petroleum and natural gas is given, starting in 1966.

Table 3-10—Employment in the Mineral Industry, 1901–1980

Year	Metals						Coal Mines			Structural Materials		Industrial Materials	Exploration and Development	Petroleum and Natural Gas Exploration and Development	Total
	Mines														
	Placer	Under	Above	Concentrates	Smelters	Total	Under	Above[1]	Total	Quarries and Pits	Plants				
1901	.....	2 736	1 212	.....	.....	3 948	3 041	933	3 974	.....	.....	.....	.....	.....	7 922
1902	.....	2 219	1 126	.....	.....	3 345	3 101	910	4 011	.....	.....	.....	.....	.....	7 356
1903	.....	1 662	1 088	.....	.....	2 750	3 137	1 127	4 264	.....	.....	.....	.....	.....	7 014
1904	.....	2 143	1 163	.....	.....	3 306	3 278	1 175	4 453	.....	.....	.....	.....	.....	7 759
1905	.....	2 470	1 240	.....	.....	3 710	3 127	1 280	4 407	.....	.....	.....	.....	.....	8 117
1906	.....	2 680	1 303	.....	.....	3 983	3 415	1 390	4 805	.....	.....	.....	.....	.....	8 788
1907	.....	2 704	1 239	.....	.....	3 943	2 862	907	3 769	.....	.....	.....	.....	.....	7 712
1908	.....	2 567	1 127	.....	.....	3 694	4 432	1 641	6 073	.....	.....	.....	.....	.....	9 767
1909	.....	2 184	1 070	.....	.....	3 254	4 713	1 705	6 418	.....	.....	.....	.....	.....	9 672
1910	.....	2 472	1 237	.....	.....	3 709	5 903	1 855	7 758	.....	.....	.....	.....	.....	11 467
1911	.....	2 435	1 159	.....	.....	3 594	5 212	1 661	6 873	.....	.....	.....	.....	.....	10 467
1912	.....	2 472	1 364	.....	.....	3 836	5 275	1 855	7 130	.....	.....	.....	.....	.....	10 966
1913	.....	2 773	1 505	.....	.....	4 278	4 950	1 721	6 671	.....	.....	.....	.....	.....	10 949
1914	.....	2 741	1 433	.....	.....	4 174	4 267	1 465	5 732	.....	.....	.....	.....	.....	9 906
1915	.....	2 709	1 435	.....	.....	4 144	3 708	1 283	4 991	.....	.....	.....	.....	.....	9 135
1916	.....	3 357	2 036	.....	.....	5 393	3 694	1 366	5 060	.....	.....	.....	.....	.....	10 453
1917	.....	3 290	2 198	.....	.....	5 488	3 760	1 410	5 170	.....	.....	.....	.....	.....	10 658
1918	.....	2 626	1 764	.....	.....	4 390	3 658	1 769	5 427	.....	.....	.....	.....	.....	9 817
1919	.....	2 513	1 746	.....	.....	4 259	4 145	1 821	5 966	.....	.....	.....	.....	.....	10 225
1920	.....	2 074	1 605	.....	.....	3 679	4 191	2 158	6 349	.....	.....	.....	.....	.....	10 028
1921	.....	1 355	975	.....	.....	2 330	4 722	2 163	6 885	.....	.....	.....	.....	.....	9 215
1922	.....	1 510	1 239	.....	.....	2 749	4 712	1 932	6 644	.....	.....	.....	.....	.....	9 393
1923	.....	2 102	1 516	.....	.....	3 618	4 342	1 807	6 149	.....	.....	.....	.....	.....	9 767
1924	.....	2 353	1 680	.....	.....	4 033	3 894	1 524	5 418	.....	.....	.....	.....	.....	9 451
1925	.....	2 298	2 840	.....	.....	5 138	3 828	1 615	5 443	.....	.....	.....	.....	.....	10 581
1926	299	2 606	1 735	808	2 461	7 610	3 757	1 565	5 322	493	324	124	.....	.....	14 172
1927	415	2 671	1 916	854	2 842	8 283	3 646	1 579	5 225	647	138	122	.....	.....	14 830
1928	355	2 707	2 469	911	2 748	8 835	3 814	1 520	5 334	412	368	120	.....	.....	15 424
1929	341	2 926	2 052	966	2 948	8 892	3 675	1 353	5 028	492	544	268	.....	.....	15 565
1930	425	2 316	1 260	832	3 197	7 605	3 389	1 256	4 645	843	344	170	.....	.....	14 032
1931	688	1 463	834	581	3 157	6 035	2 957	1 125	4 082	460	526	380	.....	.....	12 171
1932	874	1 355	900	542	2 036	4 833	2 628	980	3 608	536	329	344	.....	.....	10 524
1933	1 134	1 786	1 335	531	2 436	6 088	2 241	853	3 094	376	269	408	.....	.....	11 369
1934	1 122	2 796	1 729	631	2 890	8 046	2 050	843	2 893	377	187	360	.....	.....	12 985
1935	1 291	2 740	1 497	907	2 771	7 915	2 145	826	2 971	536	270	754	.....	.....	13 737
1936	1 124	2 959	1 840	720	2 678	8 197	2 015	799	2 814	931	288	825	.....	.....	14 179
1937	1 371	3 603	1 818	1 168	3 027	9 616	2 286	867	3 153	724	327	938	.....	.....	16 129
1938	1 303	3 849	2 266	919	3 158	10 192	2 088	874	2 962	900	295	369	.....	.....	16 021
1939	1 252	3 905	2 050	996	3 187	10 138	2 167	809	2 976	652	311	561	.....	.....	15 890
1940	1 004	3 923	2 104	1 048	2 944	10 019	2 175	699	2 874	827	334	647	.....	.....	15 705
1941	939	3 901	1 823	1 025	3 072	9 821	2 229	494	2 723	766	413	422	.....	.....	15 084
1942	489	2 920	1 504	960	3 555	8 939	1 892	468	2 360	842	378	262	.....	.....	13 270
1943	212	2 394	1 699	891	2 835	7 819	2 240	611	2 851	673	326	567	.....	.....	12 448
1944	255	1 896	1 825	849	2 981	7 551	2 150	689	2 839	690	351	628	.....	.....	12 314
1945	209	1 933	1 750	822	2 834	7 339	1 927	503	2 430	921	335	586	.....	.....	11 820
1946	347	1 918	1 817	672	2 813	7 220	1 773	532	2 305	827	555	679	.....	.....	11 933
1947	360	3 024	2 238	960	3 461	9 683	1 694	731	2 425	977	585	869	.....	.....	14 899
1948	348	3 143	2 429	1 126	3 884	10 582	1 594	872	2 466	1 591	656	754	.....	.....	16 397
1949	303	3 034	2 724	1 203	3 763	10 724	1 761	545	2 306	2 120	542	626	.....	.....	16 621
1950	327	3 399	2 415	1 259	3 759	10 832	1 745	516	2 261	1 916	616	660	.....	.....	16 612
1951	205	3 785	3 695	1 307	4 044	12 831	1 462	463	1 925	1 783	628	491	.....	.....	17 863
1952	230	4 171	3 923	1 516	4 120	13 730	1 280	401	1 681	1 530	557	529	.....	.....	18 257
1953	132	3 145	2 589	1 371	3 901	11 006	1 154	396	1 550	1 909	559	634	.....	.....	15 790
1954	199	2 644	2 520	1 129	3 119	9 412	1 076	358	1 434	1 861	638	584	.....	.....	14 128
1955	103	2 564	2 553	1 091	3 304	9 512	1 100	378	1 478	1 646	641	722	.....	.....	14 102
1956	105	2 637	2 827	1 043	3 339	9 846	968	398	1 366	1 598	770	854	.....	.....	14 539
1957	67	2 393	2 447	838	3 328	9 006	1 020	360	1 380	1 705	625	474	.....	.....	13 257
1958	75	1 919	1 809	625	3 081	7 434	826	260	1 086	1 483	677	446	.....	.....	11 201
1959	99	1 937	1 761	618	3 008	7 324	765	291	1 056	1 357	484	459	.....	.....	10 779
1960	86	1 782	1 959	648	3 034	7 423	894	288	1 182	1 704	557	589	.....	.....	11 541
1961	74	1 785	1 582	626	3 118	7 111	705	237	942	1 828	508	571	.....	.....	11 034
1962	35	1 677	1 976	949	3 356	7 958	548	228	776	1 523	481	517	270	.....	11 560
1963	43	1 713	2 012	850	3 239	7 814	501	247	748	909	460	528	450	.....	10 952
1964	5	1 839	1 967	822	3 281	7 909	446	267	713	1 293	444	509	772	.....	11 645
1965	2	1 752	2 019	965	3 529	8 265	405	244	649	1 079	422	639	786	441	12 283
1966	2	2 006	2 296	1 014	3 654	8 970	347	267	614	1 269	393	582	1 894	478	14 202
1967	.....	1 928	2 532	992	3 435	8 887	260	197	457	1 309	372	584	1 264	507	13 380
1968	.....	1 823	2 369	1 072	3 283	8 547	195	358	553	1 207	380	582	3 990	400	15 659
1969	7	1 794	2 470	1 099	3 468	8 831	245	455	700	1 097	549	567	4 270	416	16 437
1970	.....	2 160	3 167	1 331	3 738	10 396	242	1 033	1 275	740	647	627	4 964	437	19 086
1971	.....	2 073	3 058	1 513	3 481	10 125	444	1 013	1 457	846	794	666	4 040	495	18 423
1972	.....	1 833	3 463	1 734	3 353	10 383	214	1 771	1 985	1 116	800	527	4 201	458	19 470
1973	.....	1 704	4 005	2 394	3 390	11 493	265	1 951	2 216	898	802	667	3 392	454	19 922
1974	.....	1 509	4 239	2 352	2 767	10 867	267	2 255	2 522	895	782	646	2 848	509	19 069
1975	.....	1 100	3 619	1 983	3 733	10 435	299	2 464	2 763	826	725	705	2 931	518	18 903
1976	.....	1 268	3 733	2 048	3 542	10 591	327	2 300	2 627	931	680	670	3 101	495	19 095
1977	.....	1 208	3 768	2 224	3 590	10 790	312	2 556	2 868	1 380	626	766	3 537	490	20 457
1978	.....	1 009	3 874	2 029	3 838	10 750	377	2 606	2 983	734	460	618	3 232	496	19 273
1979	.....	898	3 615	2 084	4 273	10 870	413	2 931	3 344	931	601	726	3 707	489	20 668
1980	.....	**1 012**	**4 173**	**2 463**	**4 800**	**12 448**	**354**	**3 258**	**3 612**	**473**	**940**	**728**	**5 800**	**362**	**24 363**

[1] Commencing with 1967, does not include employment in by-product plants.

NOTE—These figures refer only to company employees and do not include the many employees of contracting firms.

Table 3-11—Employment at Major Metal and Coal Mines, 1980

	Tonnes		Days Operating Mill	Average Number Employed[1]					
	Mined	Milled		Administrative, Etc	Mine		Mill	Others	Total
					Surface	Underground			
Metal Mines									
Afton Mines Ltd. (Afton)	2 995 058	2 739 799	365	80	187		48		315
Bethlehem Copper Corp. (Bethlehem)	6 808 998	6 281 765	365	21	234		163		418
Brenda Mines Ltd. (Brenda)	9 324 990	9 126 860	329	127	173		179	5	484
Cominco Ltd. (Sullivan)	3 474 563	2 132 416	353	211	132	498	232		1 073
Craigmont Mines Ltd. (Craigmont)	1 885 978	1 950 551	363	52	104	63	43	1	263
Dankoe Mines Ltd. (Horn Silver)	19 634	19 634	203	11	6	28	5		50
Dekalb Mining Corp. (Highland Valley)	48 233	48 233	164	13	17	22	6		58
Dickenson Mines Ltd. (Silvana)	32 780	29 820	324	16	16	25	13		70
Erickson Gold Mining Corp. (Erickson)	28 804	28 804	337	8	18	23	13	12	74
Falconbridge Nickel Mines Ltd. (Tasu)	996 422	996 422	292	45		31	83	7	166
Gibraltar Mines Ltd. (Gibraltar)	12 579 024	12 654 522	362	147	151		313		611
Lornex Mining Corp. Ltd. (Lornex)	16 011 095	16 037 591	366	110	456		281	13	860
Mosquito Creek Gold Mining Co. Ltd. (Aurum)	11 419	11 419	306	15	2	17	13	2	49
Newmont Mines Ltd. (Similkameen Division)	6 912 566	6 612 035	365	80	145		103		328
Noranda Mines Ltd. (Bell)	5 162 167	5 011 943	366	91	90		168		349
Noranda Mines Ltd. (Boss Mountain)	483 760	483 760	366	55	7	58	84		204
Noranda Mines Ltd. (Granisle)	3 192 404	3 936 725	365	79	122		133		334
Nor-quest Resources Ltd. (Goat Ridge)	2 265	1 864	72	8		3	6		17
Northair Mines Ltd. (Warman)	70 801	71 124	365	21	17	53	13		104
Placer Development Ltd. (Endako)	11 454 209	11 103 147	361	135	142		332		609
Teck Corp. Ltd. (Highland Bell)	42 513	39 457	360	8	7	22	9		46
Utah Mines Ltd. (Island Copper)	13 883 221	13 782 249	364	83	597		204		884
Western Mines Ltd. (Lynx and Myra)	278 244	278 244	313	49	45	169	19		282
Total Metal Mines				1 465	2 668	1 012	2 463	40	7 648
Coal Mines									
B.C. Coal Ltd.	6 666 905		366	537	943	354	195		2 029
Byron Creek Collieries Ltd.	1 061 703		366	30	63		12		105
Coleman Collieries Ltd.[2]	861 642		190	15	82				97
Fording Coal Ltd.	5 573 103		366	265	455		661		1 381
Total Coal Mines				847	1 543	354	868		3 612

[1] The average number of employed includes wage-earners and salaried employees. The average is obtained by adding the monthly figures and dividing by 12, irrespective of the number of months worked.

[2] Mining operation ceased 8 July 1980.

Table 3-12—Metal Production, 1980

Property of Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
		t		g	g	kg	kg	kg	kg
Alberni Mining Division									
Lynx and Myra (Buttle Lake)	Western Mines Ltd.	278 244	Lead concentrates 3 738 t; zinc concentrates 32 642 t; copper concentrates 6 997 t.	444 126	20 453 988	1 880 636	1 568 857	17 918 936	76 262
Atlin Mining Division									
Nil									
Cariboo Mining Division									
Mosquito Creek (Wells)	Mosquito Creek Gold Mining Co. Ltd.	11 419	Gold Bullion	136 869	36 885				
Boss Mountain (Takomkane Mountain)	Noranda Mines Ltd. (Boss Mountain Div.)	533 254	Molybdenite concentrates 1 523 t containing 769 806 kg of molybdenum.		4 639 395	32 672 960			
Gibraltar (McLeese Lake)	Gibraltar Mines Ltd.	12 644 000	Copper concentrates 119 325 t; molybdenite concentrates 17 t; molybdic oxide 987 t containing 528 461 kg of molybdenum.	721	243 385	1 072	10 386	3 956	
Park (Barkerville)	Chaput Logging	172	Crude ore						
Clinton Mining Division									
Nil									
Fort Steele Mining Division									
Sullivan (Kimberley)	Cominco Ltd.	2 132 416	Lead concentrates, 115 714 t; zinc concentrates 94 518 t; tin concentrates 335 t containing 113 056 kg of tin.		86 394 417		76 095 523	51 804 218	
Golden Mining Division									
Nil									
Greenwood Mining Division									
Gem (Greenwood)	Kenar Resources	40	Crude ore	92	4 728	44	681	160	
Highland Bell (Beaverdell)	Teck Corporation	39 457	Lead concentrates 333 t; zinc concentrates 386 t; jig concentrates 98 t.	3 359	10 757 821	389	93 278	145 325	1 080
Riverside (Rock Creek)	Baykem Enterprises Ltd.	8	Crude ore	61	303		17	2	
Kamloops Mining Division									
Afton (Kamloops)	Afton Mines Ltd.	2 739 799	Copper concentrates 5 058 t; blister copper 22 510 t.	1 431 195	8 859 577	24 221 282			
Bethlehem (Highland Valley)	Bethlehem Copper Corp.	6 281 765	Copper concentrates 75 512 t; molybdenite concentrates 173 t containing 93 299 kg of molybdenum.	129 204	6 503 270	22 715 445			
OK, Alwin (Highland Valley)	Dekalb Mining Corp.	48 223	Shipments commenced in 1981.						
Lornex (Highland Valley)	Lornex Mining Corp. Ltd.	16 037 591	Copper concentrates, 203 271 t; molybdenum concentrates, 2 903 t; molybdic oxide, 1 118 t; ferro-molybdenum, 83 t containing 2 168 136 kg of molybdenum.		18 372 886	63 431 872			

Liard Mining Division					484 662	280		48	37		
Erickson (McDame Lake)	Erickson Gold Mining Corp.	28 804	Gold concentrates 561 t.								
Lake (Tootsee River)	T. Riba, Vancouver	1	Crude ore								
					404	124		7	7		
Lillooet Mining Division		6	Clean-up								
Bralorne (Bralorne)	Nelson Machinery Co. Ltd.			1 747 704	13 456 484	50 033 433					
Nanaimo Mining Division		13 782 249	Copper concentrates 219 405 t; molybdenite concentrates 2 703 t containing 1 113 074 kg of molybdenum.								
Island Copper (Rupert Inlet)	Utah Mines Ltd.										
								66	675		
Nelson Mining Division		13	Crude ore		184	3 421		326	116		
	William Grant, Nelson	46	Crude ore		3 266	2 578	123	2 952	2 177		
Bee Gee (Nelson)	G. and R. Langet, Thail	195	Crude ore		4 429	11 508		696	1 028		
Goldridge (Clearwater)	Silver Key Mining Corp.	435	Crude ore		4 264	7 123		469	435		
Keystone (Salmo)	Nugget Mines Ltd.	425	Crude ore		946	2 877		1 335			
Motherlode (Sheep Creek)	Nugget Mines Ltd.	14	Crude ore			3 851					
Nugget (Sheep Creek)	Kimberley Gold Mines										
Rachel (Nelson)											
New Westminster Mining Division											
Nil					13 312		10 794 185				
Nicola Mining Division		1 950 551	Copper concentrates 38 649 t; iron concentrates 41 562 t; coarse iron 2 649 t.		62	4 541		162	152		
Craigmont (Merritt)	Craigmont Mines Ltd.	10	Crude ore								
El Klondike (Nicola)	G. Irving, Kamloops				848 347	2 259 450	17 532 042				
Omineca Mining Division		5 011 943	Copper concentrates 65 901 t.		1 586	1 004 580	1 236	29 683	32 026		
Bell (Newman) (Babine Lake)	Noranda Mines Ltd. (Babine Div.–Bell Mine)	518	Crude ore								
	George Braun, New Hazelton	11 103 147	Molybdenum concentrates 376 t; molybdic trioxide 7 284 t; ferro-molybdenum 163 t; total content 4 651 559 kg of molybdenum.								
Dome (Hazelton)	Placer Development Ltd. (Endako Mines Div.)					17 262		648	48		
Endako (Endako)					387 083	4 075 675	13 258 799				
		31	Crude ore								
Golden Eagle (Topley)	Gordon Finch, Smithers	3 936 725	Copper concentrates 39 869 t.		6 656	31 850	229	3 376	4 030		
Granisle (Babine Lake)	Noranda Mines Ltd. (Babine Div.-Granisle Mine)	191	Crude ore								
Sunrise (Nine Mile Mountain)	M. Kryger, Smithers										

Table 3-12—Metal Production, 1980—Continued

Property of Mine (and Location of Mine)	Owner or Agent	Ore Shipped or Treated	Product Shipped	Gross Metal Content					
				Gold	Silver	Copper	Lead	Zinc	Cadmium
Osoyoos Mining Division		t		g	g	kg	kg	kg	kg
Brenda (Brenda Lake)	Brenda Mines Ltd.	9 126 860	Copper concentrates 32 390 t; molybdenite concentrates 3 330 t containing 1 855 166 kg of molybdenum.	77 494	4 816 579	9 152 418	.....	.....	.....
Horn Silver (Keremeos)	Dankoe Mines Ltd.	19 634	Bulk concentrates 678 t.	7 981	2 936 329	.....	9 275	15 273	.....
Revelstoke Mining Division									
Balden Bush (Tangier River)	G. L. Benwell, Revelstoke	6	Crude ore	.....	15 769	.....	3 897	356	.....
Canadian (Revelstoke)	C.T. Explorations Ltd.	67	Crude ore	230	6 812	.....	1 485	1 282	.....
Similkameen Mining Division									
Similkameen (Ingerbelle) (Princeton)	Newmont Mines Ltd. (Similkameen Div.)	6 612 035	Copper concentrates 90 871 t.	1 168 495	4 860 882	26 258 573	.....	.....	.....
Skeena Mining Division									
Goat Ridge (Stewart)	Nor-Quest Resources Ltd.	1 865	Silver concentrates 30 t; crude ore 1 462 t.	3 412	945 075	153	3 278	32 397	.....
Monroe (Stewart)	W. Rodway, Stewart	6	Crude ore	32	2 229	.....	.....	79	.....
Tasu (Tasu Sound)	Falconbridge Nickel Mines Ltd. (Westrob Mines Div.)	996 422	Iron concentrates 581 637 t; copper concentrates 10 689 t.	51 694	2 206 506	2 225 590	.....	.....	.....
Slocan Mining Division									
Blue Bird (Sandon)	Alsi Holdings	11	Crude ore	.....	13 958	.....	1 803	612	.....
Capello (New Denver)	Emu Enterprises	4	Crude ore	.....	4 199	.....	34	67	.....
Hall (Sandon)	Hallmac Mines Ltd.	41	Crude ore	28	180 618	.....	30 109	414	.....
Hecla (Silverton)	Mills and Mengler, Silverton	489	Crude ore	228	570 065	390	29 784	41 665	.....
Lakeview (Springer Creek)	Selmon Resources Ltd.	3	Crude ore	.....	50 294	.....	2 706	290	.....
McAllister (New Denver)	Ralph Sostad, West Vancouver	523	Crude ore	52	145 004	.....	2 501	1 788	.....
Mercury (New Denver)	P. McCrory, New Denver	18	Crude ore	.....	5 381	.....	668	1 186	.....
Meteor (Slocan)	N. Storgard, Slocan	33	Crude ore	142	15 552	.....	33	33	.....
Molly Hughes (New Denver)	Monte Lloyd, New Denver	11	Crude ore	.....	1 835	.....	264	1 167	.....
Monarch (Silverton)	Kegorhe Mines Ltd.	46	Crude ore	22	83 196	46	6 465	2 022	.....
Noonday (Slocan)	Dennis Tyres, Kaslo	5	Crude ore	.....	5 474	.....	359	441	.....
Nor 1 and 2 (Lendrum Creek)	Ron Davidson, Ainsworth	14	Crude ore	3	4 248	.....	64	107	.....
Ottawa (Springer Creek)	Memphis Mines Ltd.	596	Crude ore	.....	994 689	.....	.....	.....	.....
Panama (New Denver)	United Hearne Resources	826	Crude ore	409	904 800	809	2 889	621	.....
Pilot Bay (Pilot Bay)	D. Pearce, Nelson	.....	Clean-up	317	530 314	.....	5 820	13 194	.....
Puck (New Denver)	C. G. Pownall, New Denver	90	Crude ore	31	16 765	.....	181	181	.....
Ritch-Mitch (Slocan Lake)	David Groenhuysen	10	Crude ore	.....	7 434	.....	7 357	2 422	.....

Silmonac (Minnehaha) (Slocan Lake)	Dickenson Mines Ltd.	29 820	Lead concentrates 1 362 t; zinc concentrates 1 223 t.		7 687 934		791 327	726 989	4 410
Snowstorm (Slocan)	T. Eccles, Rossland	1	Crude ore		1 285		502	158	
Spokane (Slocan)	Arley Mines Ltd.	463	Crude ore		203 697		10 128	27 354	
Utica (12 Mile Creek)	David Minerals Ltd.	9 525	Lead concentrates 403 t; zinc concentrates 150 t; crude ore 12 t	804	1 056 989		28 755	141 958	577
Westmont (Silverton)	Hoko Exploration Ltd.	481	Lead concentrates 6 t; zinc concentrates 5 t, ore 34 t	36	89 827	54	2 389	4 956	17
Whitewater (Retallack)	Woodcrest Holdings Ltd.	18	Crude ore	218	373		18	35	
Trail Creek Mining Division									
Golden Drip (Rossland)	Lloyd McLellan, Rossland	23	Crude ore	2 657	1 564		93	24	
Vancouver Mining Division									
Warman (Northair) (Callaghan Creek)	Northair Mines Ltd.	71 124	Lead concentrates 1 779 t; zinc concentrates 2 246 t; dore bars	564 131	1 894 138	97 203	871 219	1 246 617	
Vernon Mining Division									
Black Beard (Silver Bell) (Lumly)	Black Beard Mine Inc.	16	Crude ore	31	1 337		49	33	
Zumar (Kelowna)	Zumar Resources	55	Crude ore	261	2 324		55	55	
Victoria Mining Division									
Nil									

Table 3-13A—Destination of British Columbia Ore and Concentrates, 1980

Destination	Ore	Gold-Silver Concentrates	Copper[1] Concentrates	Lead Concentrates	Zinc Concentrates	Iron Concentrates	Molybdenite Concentrates, Molybdic Trioxide Ferro-Molybdenum	Tin Concentrates
	t	t	t	t	t	t	t	t
CANADA								
Trail	8 759	30	.....	124 117	112 055	.....	.....	.....
Other Canadian	.....	.....	62 109	.....	.....	80 134[2]	1 236	.....
FOREIGN								
Australia	.....	.....	.....	.....	.....	52 675	268	.....
Belgium	.....	2	.....	.....	.....	.....	358	.....
China	.....	.....	18 185	.....	.....	.....	.....	.....
Czechoslovakia	.....	.....	.....	.....	.....	.....	103	.....
Germany	.....	.....	11 873	.....	.....	.....	1 407	.....
Japan	.....	.....	632 162	.....	.....	520 515	5 246	.....
Korea	.....	.....	4 610	.....	.....	.....	.....	.....
Romania	.....	.....	8 942	.....	.....	.....	.....	.....
Spain	.....	.....	86 863	.....	.....	.....	.....	.....
Taiwan	.....	.....	40 316	.....	.....	.....	.....	.....
U.K.	.....	.....	57 411	.....	.....	.....	.....	.....
U.S.A.	12	559	5 058	.....	19 118	.....	4 365	335
U.S.S.R.	.....	.....	2 918	.....	.....	.....	.....	.....
Europe (country not specified)	.....	.....	.....	.....	.....	.....	7 677	.....
Totals	8 771	591	930 447	124 117	131 173	653 324	20 660	335

[1] Includes blister copper.
[2] Includes small amount of coarse iron.

Table 3-13B—Destination of Ores and Concentrates Shipped from British Columbia Mines Showing Metals Paid for and Values, 1980

Country	Gold		Silver		Copper		Lead	
	g	$	g	$	kg	$	kg	$
Canada	1 448 616	29 803 491	133 161 336	101 435 967	15 596 229	38 598 235	76 709 447	66 096 223
Australia								
Belgium	286 352	6 442 920						
China			583 720	380 544	7 202 278	17 400 742		
Czechoslovakia								
Germany	132 749	2 966 057	1 072 821	763 812	3 756 795	10 475 766		
Japan	3 202 391	75 943 684	47 808 974	37 873 961	165 606 758	426 493 367		
Korea	10 276	257 208	654 885	857 967	1 275 372	3 806 081		
Romania					2 427 393	6 136 914		
Spain	225 967	4 168 519	5 980 577	5 006 661	25 818 547	62 342 472		
Taiwan	279 029	6 533 508	1 071 639	720 322	7 289 956	18 301 008		
U.K.	1 226 472	29 683 999	9 850 372	6 714 329	32 096 639	78 223 059		
U.S.A.	385 460	8 130 687	3 412 415	2 680 598	2 831 001	6 468 333		
U.S.S.R.			205 072	104 145	773 862	2 477 639		
Europe (country not specified)								
Totals	7 197 312	163 930 073	203 801 811	156 548 306	264 674 830	670 623 616	76 709 447	66 096 223

Table 3-13B—Destination of Ores and Concentrates Shipped from British Columbia Mines Showing Metals Paid for and Values, 1980

Country	Zinc		Cadmium		Iron		Molybdenum	
	kg	$	kg	$	t	$	kg	$
Canada	59 025 563	41 596 765	76 310	440 074	80 134	2 179 061	748 731	21 677 531
Australia					52 675	1 618 740	156 507	4 422 317
Belgium							190 733	4 785 104
China								
Czechoslovakia							54 193	1 355 708
Germany							592 906	13 490 533
Japan					520 515	9 872 432	1 078 099	86 808 592
Korea								
Romania								
Spain								
Taiwan								
U.K.								
U.S.A.	8 455 765	7 766 652	16 050	120 605			2 152 720	48 121 141
U.S.S.R.								
Europe (country not specified)							4 235 612	108 873 472
Totals	67 481 328	49 363 417	92 360	560 679	653 324	13 670 233	11 209 501	288 934 398

Table 3-14—Petroleum and Natural Gas, 1954–1980

Year	Crude Oil		Field Condensate		Plant Condensate		Natural Gas to Pipeline		Butane		Propane		Total Value
	m^3	$	m^3	$	m^3	$	10^3m^3	$	m^3	$	m^3	$	
1954	.....	.....	.....	.....	.....	.....	1 715	6 545	.....	.....	.....	.....	6 545
1955	93	460	.....	.....	.....	.....	4 752	18 130	.....	.....	.....	.....	18 610
1956	23 602	299 322	.....	.....	.....	.....	5 292	20 143	.....	.....	.....	.....	319 465
1957	54 901	763 751	.....	.....	4 449	no value	233 138	433 830	.....	.....	.....	.....	1 197 581
1958	81 675	1 009 609	.....	.....	39 915	380 072	1 635 204	3 368 327	12 980	26 115	10 985	22 110	4 806 233
1959	137 484	1 573 227	.....	.....	81 554	367 797	1 817 945	3 928 839	32 916	66 249	15 410	31 016	5 967 128
1960	137 981	1 531 049	.....	.....	119 377	459 741	2 257 170	7 101 949	46 643	93 878	19 888	40 029	9 226 646
1961	161 462	1 900 104	25	297	129 349	737 761	2 703 776	8 818 891	51 148	102 946	25 928	52 185	11 612 184
1962	1 415 772	16 827 118	1 530	18 184	133 206	674 644	3 062 513	10 226 323	61 618	124 019	34 500	69 438	27 939 726
1963	1 989 747	24 900 381	2 174	27 205	133 828	536 193	2 973 071	10 719 298	65 041	130 908	32 619	65 651	36 379 636
1964	1 832 404	23 396 716	4 192	63 436	146 622	587 685	3 351 574	12 192 816	73 415	147 763	38 921	78 337	36 466 753
1965	2 141 679	28 696 841	5 053	67 696	150 632	576 106	3 910 948	14 493 255	75 996	152 956	57 042	114 808	44 101 662
1966	2 645 259	36 268 683	6 291	86 265	154 946	312 360	4 543 460	17 339 587	79 650	160 311	53 153	106 981	54 274 187
1967	3 125 181	44 748 477	6 450	92 357	161 541	267 941	5 596 092	21 667 136	93 505	188 197	65 672	132 178	67 096 286
1968	3 521 783	50 082 837	8 611	122 408	152 670	247 455	6 317 544	24 531 445	83 870	168 814	63 723	128 256	75 281 215
1969	4 023 815	58 176 213	12 425	180 520	150 104	263 278	7 218 831	27 897 585	66 385	133 613	52 069	104 800	86 756 009
1970	4 032 130	60 405 941	17 052	277 829	159 489	253 009	7 678 940	29 804 411	49 074	98 772	66 828	134 505	90 974 467
1971	3 999 185	66 471 856	17 331	287 781	177 137	293 287	7 685 055	31 946 372	50 590	101 822	74 547	150 040	99 251 158
1972	3 788 849	63 166 717	16 619	277 069	161 854	327 820	9 939 498	41 616 824	54 200	106 533	76 323	150 015	105 644 978
1973	3 368 902	68 306 032	20 114	407 807	180 088	222 463	10 789 269	54 762 105	109 057	212 640	99 188	193 398	124 104 445
1974	3 012 501	103 335 328	16 561	568 075	178 534	924 549	9 016 996	128 018 726	105 426	232 085	89 373	196 742	233 275 505
1975	2 269 898	94 229 725	16 094	668 092	185 272	6 525 837	9 236 489	214 733 528	106 427	2 577 205	81 975	1 985 087	320 719 474
1976	2 367 450	116 595 050	18 309	901 711	167 576	7 198 957	8 799 508	287 997 059	109 781	4 591 832	88 195	3 688 955	420 973 564
1977	2 200 303	132 859 085	24 465	1 477 248	180 267	9 751 058	8 895 663	396 601 354	111 357	5 358 167	91 297	4 392 944	550 439 856
1978	2 004 699	145 005 524	25 386	1 836 217	155 503	10 269 861	8 003 029	401 373 236	106 580	5 932 766	85 732	4 513 147	568 931 051
1979	2 139 963	168 928 671	32 549	2 569 418	184 398	13 396 500	11 392 641	699 508 127	112 683	7 122 711	84 864	4 851 698	896 377 125
1980	2 002 128	184 347 641	36 855	3 605 414	133 601	13 657 452	8 931 833	546 911 784	89 556	7 350 486	75 507	5 190 597	761 063 374
Totals	52 478 846	1 493 826 378	288 086	13 535 029	3 421 912	68 231 826	146 002 546	2 996 037 625	1 747 898	35 180 788	1 383 739	26 393 217	4 633 204 863